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United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with the
Texas Agricultural
Experiment Station and
the Texas State Soil and
Water Conservation
Board

Soil Survey of Leon County, Texas

A 57.38:

How To Use This Soil Survey

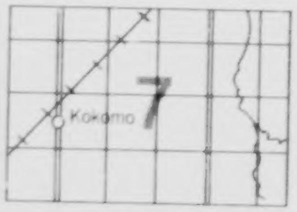
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

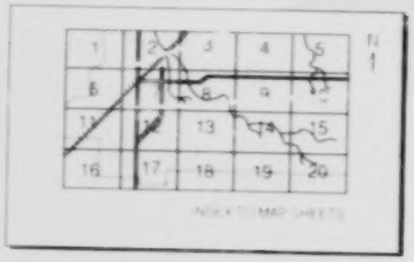
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



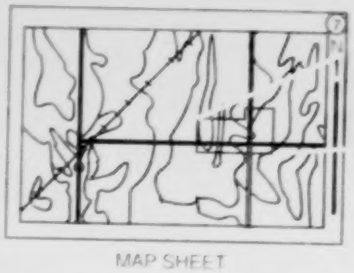
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets** which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

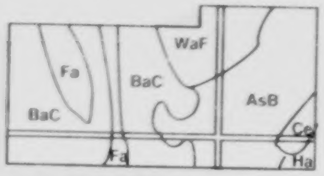


INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1984. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. This soil survey was made cooperatively by the Soil Conservation Service, the Texas Agricultural Experiment Station, and the Texas State Soil and Water Conservation Board. It is part of the technical assistance furnished to the Freestone-Leon and the Bedias Creek Soil and Water Conservation Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: Because of the rolling topography and adequate rainfall, pond sites for recreation and for livestock and wildlife are available throughout Leon County.

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Foreword

This soil survey contains information that can be used in land-planning programs in Leon County, Texas. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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State Conservationist
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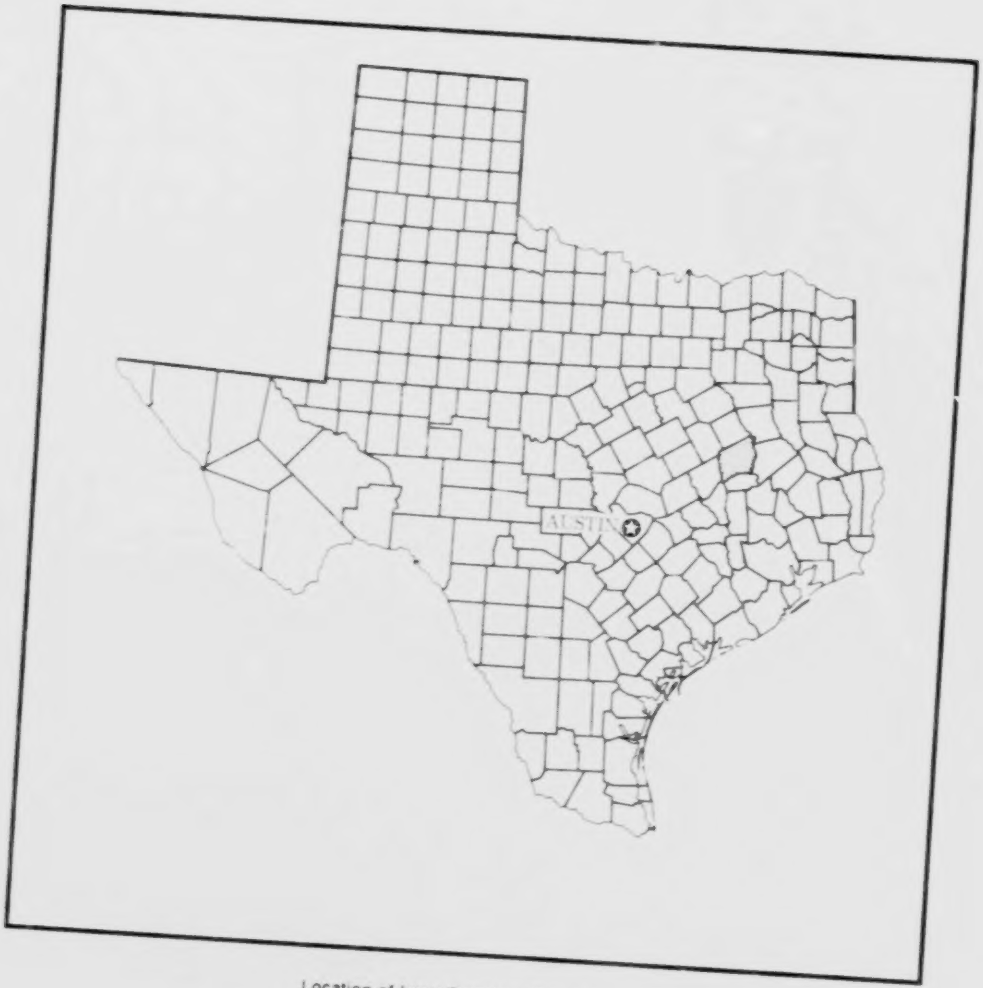

Location of Leon County in Texas

Soil Survey of
Leon County, Texas

By Conrad L. Neitsch, Joseph J. Castille, and Maurice R. Jurena,
Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
the Texas Agricultural Experiment Station and the Texas State Soil and Water
Conservation Board

LEON COUNTY is in the east part of central Texas. The total area, which includes water areas, is 690,861 acres, or 1,079 square miles. The county is irregularly shaped and is about 28 miles long and 40 miles wide. The elevation ranges from about 630 feet above sea level in the west-central part of the county to about 140 feet above sea level in the southeast part of the county. The topography is undulating to gently rolling and generally slopes to the southeast.

Leon County is in the Western Coastal Plain, Texas Claypan Area, and Texas Blackland Prairie Major Land Resource Areas. The soils formed under timber, post oak savannah, and prairie vegetation. The soils that formed under timber or post oak savannah are light-colored fine sandy loam to fine sand, and the soils that formed under grass are dark-colored fine sandy loam to clay. The county is drained by numerous creeks and streams that flow into the Trinity and Navasota Rivers, which bound the county on the east and west, respectively.

The beef cattle industry is important to the economy of Leon County. In January 1983, Leon County was ranked first in the state in numbers of beef cows that calved *(13)*. Most of the county is used as rangeland, pastureland, or hayland. Some limited acreage is used as cropland, mainly for cotton, grain sorghum, peanuts, soybeans, and truck crops.

General Nature of the Survey Area

This section gives general information concerning Leon County. It discusses settlement and population, agriculture, natural resources, and climate of the county.

Settlement and Population

Leon County, named for Martin de Leon, the Spanish founder of Victoria, Texas, was created from Robertson County in 1846. In the eighteenth century, the Kichai Indians occupied the wooded northeastern part of the county, and the Deadose Indians occupied the open prairies in the southwestern part *(11)*. The Alibamos and Kickapoos tribes migrated into the county from the eastern and northern parts of the United States and settled along the Trinity River. These tribes migrated or disappeared after white settlers came to the area.

The Old Spanish Road, which connected Natchitoches in Louisiana with San Antonio, was routed through the central part of the county in the early 1700's and was rerouted in the late 1700's along and near the south boundary of the county. This was an important route used by the Spanish, Mexican, and early Texas settlers for trade. Early settlements were along and near this road, but by 1850, settlements had been established throughout the county.

Centerville, the county seat, had a population of 805 in 1980. Other cities in the county are Buffalo, Oakwood, Jewett, Marquez, Normangee, and Leona. The county population in 1980 was 9,594.

Agriculture

Livestock, hay, crops, and wood products are the main agricultural enterprises in Leon County. Crop production, mainly cotton and corn, was once the primary land use, but pasture and hayland have replaced cultivated crops in most areas.

Livestock operations are mainly cow-calf. Beef cattle sales accounted for about 50 percent of the agricultural income in 1981. The livestock are mainly pastured in summer and are fed hay and feed supplements in winter. Cattle graze improved cool-season grasses and legumes in the winter and spring and early in summer.

Crop production consists mainly of hay and forage. Cotton, wheat, corn, grain sorghum, soybeans, peanuts, watermelons, and vegetables are also grown. Commercial vegetable and fruit production has increased during the past few years.

Small commercial tracts of timber are in Leon County. Landowners produce both pine and hardwood timber. Pine is sold for pulpwood, posts, crossties, and other wood products. Mature pine stands are sold for sawtimber. Hardwood forests are cut mainly for crossties, pulpwood, or firewood. With improved management and marketing, timber production could be a major agricultural enterprise.

Natural Resources

Soil is the most important natural resource in Leon County. Livestock and hay and forage crops are the main sources of income in the county.

Lignite coal mining for energy production will become increasingly important in the northwest part of the county. The main oil and gas fields are in the Leona, Guys Store, and Lone Star areas; however, wells are in production throughout the county.

Water is an important natural resource. Lake Limestone, in the northwest part of the county, provides cooling water for electric generating plants, flood control, fishing, and other recreational activities. The Trinity River, Navasota River, and numerous smaller streams, creeks, and lakes provide abundant water supplies for the county. Farm ponds, many of which are spring fed, are numerous. Most of the county has ample supplies of good quality underground water for industrial, recreational, agricultural, and domestic uses.

Fish and wildlife are another important natural resource in Leon County. Most areas of the county are leased for deer hunting, which provides added income to landowners.

Timber production is limited in the county, but improved management and marketing could provide for additional income. Most of the soils in the eastern part of the county have good potential for growing pine or hardwood trees.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

Leon County is hot in summer but cool in winter when an occasional surge of cold air causes a sharp drop in otherwise mild temperatures. Rainfall is uniformly distributed throughout the year, reaching a slight peak in spring. Snowfalls are infrequent. Annual total precipitation is normally adequate for cotton, feed grains, and small grains.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Centerville, Texas, in the period 1951 to 1981. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 49 degrees F, and the average daily minimum temperature is 37 degrees. The lowest temperature on record, which occurred at Centerville on February 1, 1951, is 0 degrees. In summer the average temperature is 82 degrees, and the average daily maximum temperature is 94 degrees. The highest recorded temperature, which occurred at Centerville on July 26, 1954, is 111 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 21 inches, or 50 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 8.5 inches at Centerville on October 14, 1957. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is 1 inch. The greatest snow depth at any one time during the period of record was 3 inches. On an average, there are no days that have at least 1 inch of snow on the ground.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 13 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are local and of short duration, and the pattern of damage is variable and spotty.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes, the general pattern of drainage, the kinds of crops and native plants growing on the soils, and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material from which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are generally collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or included soils. In the general soil map units, they are called soils of minor extent.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Dominantly Sandy Soils of the Uplands

This group of general soil map units makes up about 62 percent of Leon County. The Arenosa, Cuthbert, Hearne, Padina, Pickton, Silstid, Tonkawa, and Wolfpen soils are dominant in this group. These soils developed mostly in sandy and loamy sediments of the Claiborne Geological Group. The landscape is undulating to rolling. Native grasses are mainly bluestem, indiangrass, lovegrass, paspalum, and panicum. Trees are predominantly oak and hickory.

Most soils in this group are droughty, have low natural fertility, and are not well suited to most crops. Adapted crops are peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Improved bermudagrass, weeping lovegrass, and bahiagrass are adapted pasture plants.

The scenic, rolling countryside makes desirable homesites. Houses and roads are easily built and maintained. Seepage through the sandy soils restricts septic tank absorption systems. Ground water supplies should be protected from effluent contamination.

1. Wolfpen-Pickton-Cuthbert

Gently sloping to moderately steep, deep, sandy and loamy soils that are well drained; in woodlands

In this map unit, the landscape is typically broad, sandy ridges and divides with some loamy side slopes. Drainage is poorly defined on the ridges and divides, but it is well defined below the side slopes. Most rainfall enters the deep, loose sand, and seeps and springs are common along the lower edges of the side slopes. The small drainageways go off the ridges and divides in all directions but eventually enter creeks flowing generally southeastward to the Trinity River. Vertical relief is mainly 100 to 150 feet within a distance of less than 1 mile. The underlying material is interbedded, crossbedded, or braided sandy and loamy sediments. It is a clayey bed in a few areas. The soils of this map unit formed mostly in the Carrizo Sand, Queen City Sand, and Sparta Sand Formations, with some areas in the Reklaw, Stone City, and Cook Mountain Formations. Areas of this map unit are an important aquifer source.

This map unit makes up about 29 percent of the county. It is 24 percent Wolfpen soils, 23 percent Pickton soils, 21 percent Cuthbert soils, and 32 percent soils of minor extent (fig. 1).

Wolfpen soils are on broad ridges, divides, and shoulder slopes. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is mottled red, gray, and brown sandy clay loam. These soils are very strongly acid to slightly acid.

Pickton soils are on broad divides and foot slopes. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is brownish sandy clay loam that has yellowish and reddish mottles. These soils are very strongly acid to slightly acid.

Cuthbert soils are on narrow ridgetops and side slopes. Typically, the surface and subsurface layers are brownish fine sandy loam. The subsoil is reddish clay in the upper part, and in the lower part, it is yellowish clay loam mottled with layers of red and light gray shale.

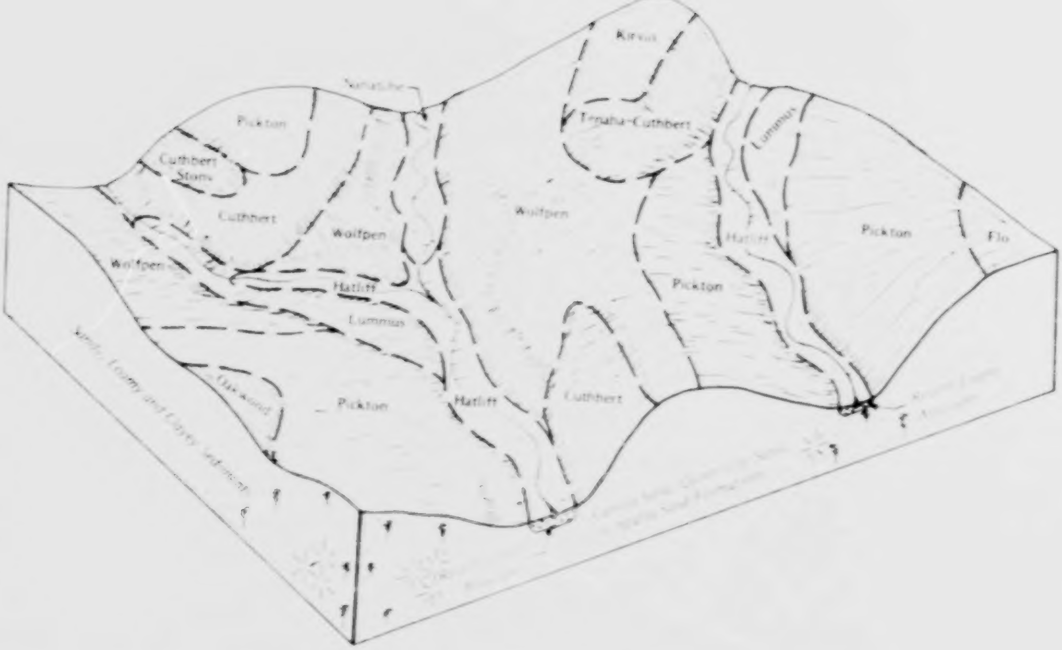

Figure 1.—Pattern of soils and underlying material in the Wolfpen-Pickton-Cuthbert general soil map unit.

The substratum is stratified sandstone and shale. These soils are very strongly acid or strongly acid.

Of minor extent in this map unit are Flo, Hatliff, Kirvin, Larue, Lummus, Melhomes, Nahatche, Oakwood, Tenaha, Tonkawa, and Woodtell soils. Flo, Larue, and Tonkawa soils are on ridges and divides. Hatliff and Nahatche soils are on flood plains of small creeks. Kirvin, Oakwood, and Woodtell soils are on shoulder slopes, side slopes, knolls, and small ridges. Lummus and Melhomes soils are at the head of drainageways, along poorly defined drainageways, and on toe slopes. Tenaha soils are on side slopes and on hills.

The soils of this map unit are used mainly as pasture, hayland, or woodland. They are used as pasture or hayland in most of the smoother areas and as woodland in some of the smoother areas and in most of the rougher, more sloping areas. These soils are used as cropland only in a few areas.

Most of the pasture and hay is improved bermudagrass. Weeping lovegrass is also a suitable pasture plant. The main limitation for use as pasture and hayland is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The dominant commercial trees are loblolly pine, shortleaf pine, and southern red oak. Droughtiness and steepness of slope are limitations for woodland use and management. In most woodland areas, the native understory is grazed by livestock and game animals.

The loose, permeable sands and the steepness of slope limit the use of these soils for urban development. Seepage of effluent or other contaminants into the underground water is a serious hazard. On steep slopes, roads and buildings can be designed to prevent slippage and failure.

2. Padina-Silstid-Hearne

Gently sloping to moderately steep, deep, sandy and loamy soils that are well drained and moderately well drained; on savannahs

In this map unit, the landscape typically is broad, sandy ridges and divides with some loamy side slopes. Drainage is poorly defined on the ridges and divides but is well defined below the side slopes. Most rainfall enters the deep, loose sand, and seeps and springs are common along the lower edge of the side slopes. The small drainageways go off the ridges and divides in all directions but eventually enter creeks that flow southwestward to the Navasota River or southeastward to the Trinity River. The basic drainage divide is mainly along Farm Road 39 from Jewett to Normangee. Vertical relief is mainly 50 to 100 feet within a distance of less than 1 mile. The underlying material is interbedded, crossbedded, or braided sandy and loamy sediments. It is a clayey bed in a few areas. The soils of this map unit formed mostly in the Carrizo Sand, Queen City, Sparta Sand, and Stone City Formations with some areas in the Reklaw Formation. Areas of this map unit are an important aquifer source.

This map unit makes up about 21 percent of the county. It is 29 percent Padina soils, 22 percent Silstid soils, 19 percent Hearne soils, and 30 percent soils of minor extent.

Padina soils are on broad divides and foot slopes. These soils are moderately well drained. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is sandy clay loam. The upper part is brownish with grayish mottles, and the lower part is mottled in shades of gray, red, and yellow. These soils are strongly acid or medium acid.

Silstid soils are on broad ridges and divides. These soils are well drained. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is brownish and yellowish sandy clay loam. These soils are medium acid or slightly acid.

Hearne soils are on narrow ridgetops and side slopes. These soils are well drained. Typically, the surface and subsurface layers are brownish fine sandy loam. The subsoil is reddish clay. The substratum is stratified shale and sandstone. These soils are very strongly acid or strongly acid.

Of minor extent in this map unit are Arenosa, Dutek, Eufaula, Gasil, Hatliff, Marquez, Melhomes, Nahatche, Rader, Robco, and Silawa soils. Arenosa soils are on high, smooth divides. Dutek soils are on low ridges of foot slopes. Eufaula, Rader, and Silawa soils are on local stream terraces. Gasil and Marquez soils are on foot slopes. Hatliff and Nahatche soils are on flood plains of small creeks. Melhomes soils are at the head of drainageways, along poorly defined drainageways, and on toe slopes. Robco soils are at the head of drainageways and on side slopes.

The soils of this map unit are used mainly as range. They are used as pasture or hayland in many of the smoother areas and as cropland in a few areas.

The rangeland plants are tall grasses in an oak savannah. Droughtiness is the main limitation for rangeland use.

Most of the pasture and hay is improved bermudagrass and weeping lovegrass. Droughtiness and low available water capacity limit the use of these soils for pasture and hay. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The loose, permeable sand and the steepness of slope limit the use of these soils for urban development. Seepage of effluent or other contaminants into the underground water is a serious hazard. On steep slopes, roads and buildings can be designed to prevent slippage and failure.

3. Padina-Arenosa

Gently sloping to moderately steep, deep, sandy soils that are moderately well drained and somewhat excessively drained; on savannahs

In this map unit, the landscape typically is broad, undulating divides that are some of the highest points in the county. Drainage is poorly defined, and most rainfall enters the deep, loose sand. Seeps and springs are common along the edges of the divides. Vertical relief is mainly less than 100 feet within a distance of 1 mile. The underlying material is thick layers of sand interbedded with loamy sediment. The soils of this map unit formed mostly in the Carrizo Sand and Sparta Sand Formations with some areas in Queen City Sand and Reklaw Formations. Areas of this map unit are an important aquifer source.

This map unit makes up about 7 percent of the county. It is 45 percent Padina soils, 35 percent Arenosa soils, and 20 percent soils of minor extent (fig. 2).

Padina soils are on broad divides and side slopes. These soils are moderately well drained. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is sandy clay loam. The upper part is brownish with grayish mottles, and the lower part is

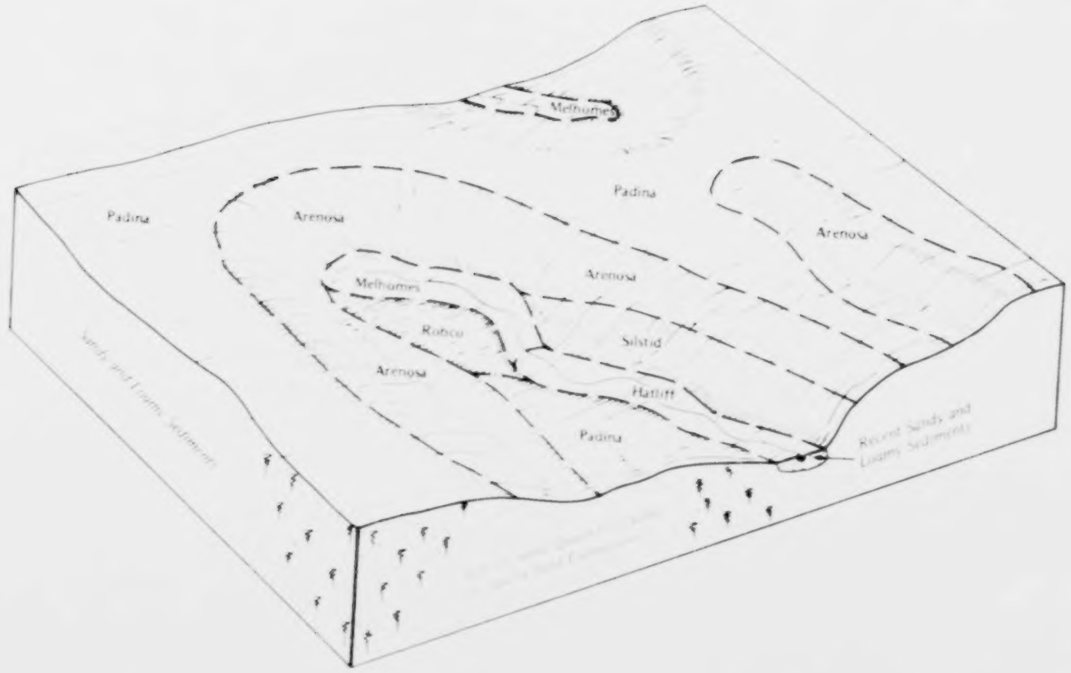

Figure 2.—Pattern of soils and underlying material in the Padina-Arenosa general soil map unit.

mottled in shades of gray, red, and yellow. These soils are strongly acid or medium acid.

Arenosa soils are on broad divides and foot slopes. These soils are somewhat excessively drained. Typically, the surface layer is brownish fine sand. The underlying material is fine sand that grades from pink to very pale brown. These soils are medium acid or slightly acid.

Of minor extent in this map unit are Eufaula, Hatliff, Hearne, Melhomes, Robco, and Silstid soils. Eufaula soils are on toe slopes along small streams. Hatliff soils on are flood plains of local streams. Hearne soils are on shoulder slopes. Melhomes soils are at the head of drainageways, along poorly defined drainageways, and on toe slopes. Robco soils are at the head of drainageways and on side slopes. Silstid soils are in landscape positions similar to those of the Padina soils.

The soils of this map unit are used mainly as rangeland. They are used as pasture or hayland in some of the smoother areas and as cropland in a few areas.

The rangeland plants are tall grasses in an oak savannah. Droughtiness is the main limitation for rangeland use.

Most of the pasture and hay is improved bermudagrass and weeping lovegrass. Droughtiness and low available water capacity limit the use of these soils for pasture and hay. Pastures require light applications of fertilizer and lime at frequent intervals for best production. Legumes, such as vetch and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The loose, permeable sand limits the use of these soils for urban development. Seepage of effluent or other contaminants into the underground water is a serious hazard.

4. Pickton-Tonkawa

Gently sloping to moderately steep, deep, sandy soils that are well drained to excessively drained; in woodlands

In this map unit, the landscape typically is broad, undulating divides. Drainage is poorly defined, and most rainfall enters the deep, loose sand. Seeps and springs are common along the edges of the divides. Vertical relief is mainly less than 100 feet within a distance of 1 mile. The underlying material is thick layers of interbedded or braided sandy and loamy sediments. The soils of this map unit formed mostly in the Queen City Sand and Sparta Sand Formations. Areas of this map unit are an important aquifer source.

This map unit makes up about 5 percent of the county. It is 51 percent Pickton soils, 14 percent Tonkawa soils, and 35 percent soils of minor extent.

Pickton soils are on broad divides and side slopes. These soils are well drained. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is brownish sandy clay loam that has yellowish and reddish mottles. These soils are very strongly acid to slightly acid.

Tonkawa soils are on broad divides and foot slopes. These soils are excessively drained. Typically, the surface layer is brownish fine sand. The underlying material is brownish fine sand in the upper part and is white fine sand in the lower part. These soils are slightly acid throughout.

Of minor extent in this map unit are Cuthbert, Flo, Hatliff, Lummus, Melhomes, Tenaha, and Wolfpen soils. Cuthbert and Tenaha soils are on shoulder slopes. Flo soils are on ridges and side slopes. Hatliff soils are on flood plains of small streams. Lummus and Melhomes soils are at the head of drainageways, along poorly defined drainageways, and on toe slopes. Wolfpen soils are in landscape positions similar to those of the Pickton soils.

The soils in the smoother areas of this map unit are used mainly as pasture or hayland. They are used as woodland in some of the smoother areas and in most of the rougher, more sloping areas. These soils are used as cropland only in a few areas.

Most of the pasture and hayland is improved bermudagrass and weeping lovegrass. The main limitation for use as pasture and hayland is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for best production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The dominant commercial trees are loblolly pine and shortleaf pine. Droughtiness and steepness of slope are limitations for woodland use and management. In most woodland areas, the native understory is grazed by livestock and game animals.

The loose, permeable sand limits the use of these soils for urban development. Seepage of effluent or other contaminants into the underground water is a serious hazard.

Dominantly Loamy Soils of the Uplands

This group of general soil map units makes up about 16 percent of Leon County. The Axtell, Benchley, Bub, Crockett, Cuthbert, Jedd, Lexton, Margie, Rader, Trawick, and Wilson soils are dominant in this group. These soils have developed mostly in loamy and clayey sediments of the Claiborne and Wilcox Geological Groups. The landscape ranges from broad, nearly level to gently sloping areas to steep scarps. Native grasses are bluestem, indiangrass, switchgrass, paspalum, and Texas wintergrass. Trees are predominantly oak, elm, and hackberry.

Most soils in this group are highly erodible. They have a subsoil that shrinks and swells and that restricts movement of water and roots. These soils are droughty in the summer because most rainfall runs off before it can enter the soil. In the smoother areas, the soils are suitable for cotton, corn, grain sorghum, and small grains. Nitrogen and phosphorus fertilizers are needed for good yields. Improved bermudagrass and bahiagrass are suitable pasture plants.

The crests of the steep scarps are scenic and make desirable homesites. Houses and roads should be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields should be designed to overcome the restricted permeability, or sewage lagoons should be used.

5. Crockett-Benchley-Wilson

Nearly level to strongly sloping, deep, loamy soils that are moderately well drained and somewhat poorly drained; on prairies

In this map unit, the landscape typically is broad, smooth ridges. Drainage is through small, shallow, generally southward flowing drainageways. Much of the rainfall runs off before it can enter the crusty surface of these slowly and very slowly permeable soils. Vertical relief is mainly less than 50 feet within a distance of 1 mile. The underlying material is stratified clay, shale, marl, and sandstone, which are mainly of the Cook Mountain Formation in the Claiborne Group.

This map unit makes up about 5 percent of the county. It is 46 percent Crockett soils, 12 percent Benchley soils, 8 percent Wilson soils, and 34 percent soils of minor extent (fig. 3).

Crockett soils are on broad, nearly level to gently sloping ridges and strongly sloping side slopes. These soils are moderately well drained. Typically, the surface layer is brownish fine sandy loam. The subsoil is brownish clay that has mottles in shades of red and yellow. These soils are medium acid in the surface layer and neutral to moderately alkaline in the subsoil.

Benchley soils are on broad, gently sloping ridges, in weakly defined saddles; and on foot slopes near small drainageways. These soils are moderately well drained. Typically, the surface layer is grayish clay loam. The subsoil is clay that is grayish in the upper part, reddish in the middle part, and brownish in the lower part. It has mottles in shades of red, brown, and gray. The substratum is brown stratified shale and weakly cemented sandstone. These soils are medium acid or slightly acid.

Wilson soils are on broad, gently sloping ridges, mainly in a complex with Crockett soils, and are somewhat poorly drained. Typically, the surface layer is grayish clay loam. The subsoil is grayish clay that has grayish and yellowish mottles in the lower part. These soils are medium acid in the surface layer and the upper part of the subsoil and are moderately alkaline in the lower part of the subsoil.

Of minor extent in this map unit are Dimebox, Ferris, Gasil, Gowker, Hatliff, Hearne, Kaufman, Mabank, Marquez, Rader, Robco, and Silstid soils. Dimebox soils are on nearly level tops of broad ridges, in level saddles, or alongside small drainageways. Ferris soils only occur on the Marquez salt dome. They are formed in Cretaceous marl and clay and are included with this group because of their similarity to other soils of this map unit. Gasil and Silstid soils are on ridges on remnants of the Stone City Formation on the northern edge of the delineation. Gowker, Hatliff, and Kaufman soils are on flood plains of small creeks. Hearne and Marquez soils are on strongly sloping to moderately steep side slopes and knolls on remnants of the Stone City Formation. Mabank soils are in nearly level, smooth areas at the head of drainageways or in saddles on ridges. Rader and Robco soils formed in a terrace veneer on foot slopes or at the head of drainageways.

The soils of this map unit are used mainly as pasture or hayland. They are used as rangeland in some areas and as cropland in a few areas.

Most of the pasture and hay is improved bermudagrass. Droughtiness is the main limitation for use as pasture and hayland. Fertilizers are needed to sustain yields. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The rangeland plants are tall grasses with a few elm and hackberry trees along drainageways. Summer droughtiness is the main limitation for rangeland use.

The soils of this map unit are used for grain sorghum and small grains. Corn and cotton were grown on these soils in the past. The soils are droughty during the summer, and the surface is crusty when dry. Cover crops, contour farming, and terraces help control erosion. Crops respond to nitrogen and phosphorus fertilizers.

The high shrink-swell potential of the subsoil and restricted permeability limit the use of these soils for urban development. Steepness of slope and wetness are also limiting features of some soils. Structures can be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields can be designed to overcome the restricted permeability, or sewage lagoons can be used.

6. Axtell-Rader

Nearly level to strongly sloping, deep, loamy soils that are moderately well drained; on savannahs

In this map unit, the landscape typically is broad, smooth ridges and divides. The soils formed in a thin terrace veneer over three geological formations. The drainage pattern varies with the formation. Drainage is to the west in the area adjoining Lake Limestone. This area is over the Calvert Bluff Formation of the Wilcox Group. The area between Marquez and Newby is over the Marquez member of the Reklaw Formation, and the drainage flows off the divide in all directions. Drainage is to the northeast in the southeast part of the county, which is over the Mount Tabor member of the Cook Mountain Formation. Small drainageways begin in areas of this map unit. Vertical relief is mainly less than 50 feet within a distance of 1 mile. The underlying material is a thin veneer of loamy and clayey terrace sediments of Quaternary age that have been partly reworked by wind. The veneer overlies stratified clay, mudstone, and sandstone of Tertiary age.

This map unit makes up about 4 percent of the county. It is 49 percent Axtell soils, 21 percent Rader soils, and 30 percent soils of minor extent.

Axtell soils are on broad, nearly level and gently sloping ridgetops and strongly sloping side slopes. Typically, the surface and subsurface layers are

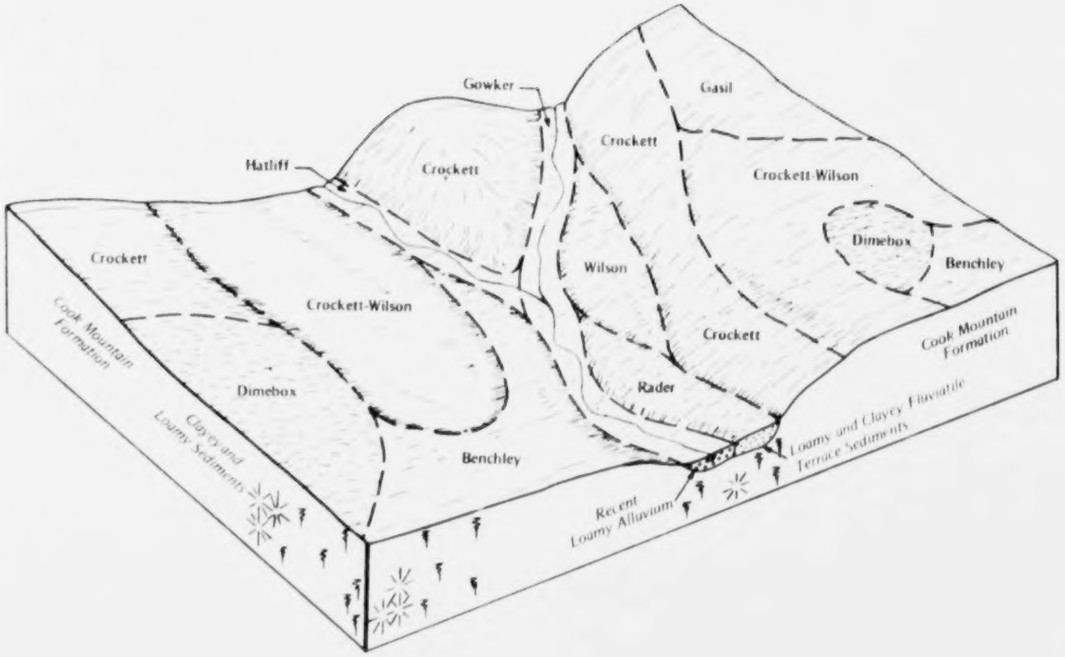
Gowker
Gasil
Hatliff
Crockett
Crockett
Crockett-Wilson
Crockett
Dimebox
Benchley
Crockett-Wilson
Wilson
Cook Mountain Formation
Crockett
Dimebox
Rader
Benchley
Clayey and Loamy Sediments
Cook Mountain Formation
Loamy and Clayey Fluviatile Terrace Sediments
Recent Loamy Alluvium

Figure 3.—Pattern of soils and underlying material in the Crockett-Benchley-Wilson general soil map unit.

brownish fine sandy loam. The subsoil is clay that is reddish in the upper part and is brownish and yellowish layers in the lower part. It has mottles in shades of red and gray throughout. These soils are strongly acid in the upper part and grade to mildly alkaline in the lower part.

Rader soils are on broad, gently undulating, slightly mounded ridgetops; at the head of drainageways; and on foot slopes. Typically, the surface and subsurface layers are brownish fine sandy loam. The subsoil is brownish sandy clay loam in the upper part and is grayish clay in the lower part. The lower part of the subsoil has red mottles. These soils are slightly acid in the surface and subsurface layers, strongly acid in the upper part of the subsoil, and neutral in the lower part.

Of minor extent in this map unit are Gasil, Hatliff, Hearne, Lufkin, Mabank, Marquez, Robco, Silstid, Tabor, and Wilson soils. Gasil and Silstid soils are on ridgetops. Hatliff soils are on flood plains of small streams. Hearne and Marquez soils are on strongly sloping to moderately steep side slopes and knolls. Lufkin, Mabank, Tabor, and Wilson soils are in flat areas at the head of drainageways, in saddles, or on toe slopes. Robco soils are on concave side slopes.

The soils of this map unit are used mainly as pasture or hayland. In some areas, they are used as rangeland. These soils generally are not used as cropland.

Most of the pasture and hay is improved bermudagrass, weeping lovegrass, and kleingrass. Fertilizer and lime are needed for sustained yields. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The rangeland plants are tall grasses in an oak savannah.

Although crops generally are not planted, they have been grown on these soils in the past. Corn, cotton, grain sorghum, and small grains are suitable crops. The soils are droughty during the summer and wet during the winter. The surface is crusty when dry.

The high shrink-swell potential of the subsoil and restricted permeability limit the use of these soils for urban development. Steepness of slope and wetness are also limiting features of some soils. Structures can be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields can be designed to overcome the restricted permeability, or sewage lagoons can be used.

7. Margie-Jedd-Lexton

Gently sloping to steep, deep and moderately deep, loamy soils that are well drained; on savannahs

In this map unit, the landscape typically is strongly sloping to steep side slopes, escarpments, and cuestas and a few gently sloping ridges. Drainage consists of deeply incised small streams and creeks. Vertical relief mainly exceeds 100 feet within a distance of 0.25 mile. The underlying material is glauconitic greensand of the Weches Formation in the Claiborne Group.

This map unit makes up about 4 percent of the county. It is 52 percent Margie soils, 12 percent Jedd soils, 8 percent Lexton soils, and 28 percent soils of minor extent (fig. 4).

Margie soils are on gently sloping to strongly sloping side slopes. These soils are deep. Typically, the surface layer is brownish fine sandy loam. The subsoil is reddish. It is sandy clay loam underlain by clay in the upper part, very gravelly sandy clay in the middle part, and sandy clay loam in the lower part. These soils are strongly acid to slightly acid.

Jedd soils are on strongly sloping and steep side slopes. Some areas of these soils are stony. Jedd soils are moderately deep. Typically, the surface layer is brown gravelly sandy loam. The subsoil is reddish clay in the upper part and brownish clay and weathered glauconitic material in the lower part. These soils are neutral in the surface layer and very strongly acid or strongly acid in the subsoil.

Lexton soils are on gently sloping ridges. These soils are deep. Typically, the surface layer is brownish clay loam. The subsoil is clay that is brownish in the upper part and reddish in the lower part. The substratum is brownish clay and weathered glauconitic material. These soils are slightly acid in the surface layer, medium acid in the subsoil, and mildly alkaline in the substratum.

Of minor extent in this map unit are Benchley, Flynn, Gasil, Hatliff, Hearne, Marquez, Padina, Rader, Robco, and Silstid soils. Benchley soils are at the head of drainageways within areas of the Lexton soils. Flynn soils are lower on side slopes than the Margie and Jedd soils. Gasil soils are on foot slopes. Hatliff soils are on flood plains of small streams. Hearne soils are on ridgetops and side slopes. Marquez soils are on small knolls and ridges. Padina and Silstid soils are on high ridges or knolls that are remnants of the Queen City Sand and Sparta Sand Formations. Rader soils are on local stream terraces. Robco soils are on foot slopes or at the head of drainageways.

The soils of this map unit are used mainly as rangeland. In some areas, they are used as pasture or hayland. These soils generally are not used as cropland.

The rangeland plants are tall grasses in an oak savannah. The rangeland is mainly in the more steeply sloping areas or in gravelly and stony areas.

Most of the pasture and hayland is improved bermudagrass and is in the smoother areas of Margie and Lexton soils. Fertilizer and lime are needed for sustained yields. Arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas overseeded into the grass lengthen the grazing season and improve the soil.

Although crops generally are not planted, they have been grown in the smoother areas in the past. Corn, cotton, grain sorghum, and small grains are suitable crops.

Steepness of slope, shrinking and swelling of the subsoil, and restricted permeability limit the use of these soils for urban development. Roads and structures should be designed to prevent slippage downslope. Structures can be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields can be designed to overcome the restricted permeability, but care must be taken to prevent effluent seeping to the surface downslope.

8. Trawick-Bub-Cuthbert

Gently sloping to moderately steep, deep and shallow, loamy soils that are well drained; in woodlands

In this map unit, the landscape typically is strongly sloping to moderately steep side slopes and cuestas and a few gently sloping ridges. Drainage consists of deeply incised small streams and creeks. Vertical relief mainly exceeds 100 feet within a distance of 0.25 mile. The underlying material is glauconitic greensand of the Weches Formation in the Claiborne Group.

This map unit makes up about 3 percent of the county. It is 42 percent Trawick soils, 18 percent Bub soils, 13 percent Cuthbert soils, and 27 percent soils of minor extent.

Trawick soils are on gently sloping ridges and moderately steep side slopes. These soils are deep.

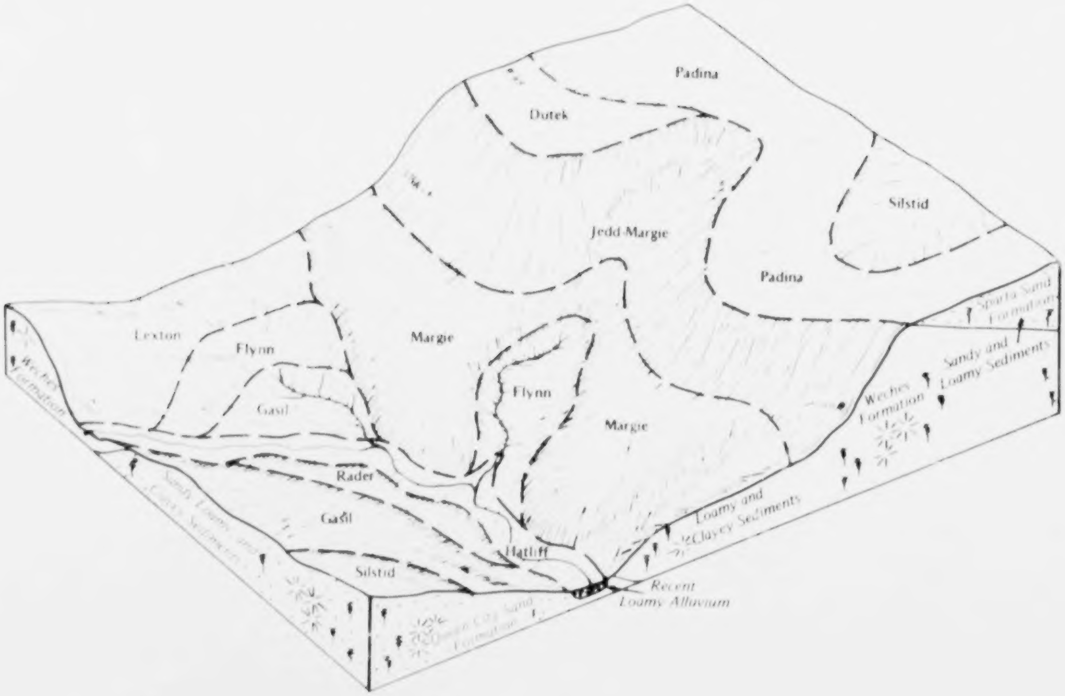
Padina
Dutek
Silstid
Jedd-Margie
Padina
Lexton
Flynn
Margie
Gasil
Flynn
Margie
Rader
Gasil
Hatliff
Silstid
Weches Formation
Sandy Loamy and Clayey Sediments
Queen City Sand Formation
Recent Loamy Alluvium
Loamy and Clayey Sediments
Weches Formation
Sandy and Loamy Sediments
Sparta Sand Formation

Figure 4.—Pattern of soils and underlying material in the Margie-Jedd-Lexton general soil map unit.

Typically, the surface layer is red fine sandy loam. The subsoil is red clay in the upper part. The lower part is interbedded with weathered glauconitic material. The substratum is weathered glauconitic material and glauconitic greensand. These soils are strongly acid to slightly acid.

Bub soils are on the apex of ridgetops and steeper parts of side slopes. These soils occur only in a complex with Trawick soils. The Bub soils are shallow. Typically, the surface layer is brownish gravelly clay loam. The subsoil is red clay that has yellow mottles in the lower part. The substratum is ironstone and weathered glauconitic material. These soils are very strongly acid to slightly acid.

Cuthbert soils are on strongly sloping to moderately steep side slopes. These soils are deep. In some areas, these soils are stony. Typically, the surface and subsurface layers are brownish fine sandy loam. The subsoil is reddish clay in the upper part and yellowish clay loam in the lower part. The substratum is stratified sandstone and shale. These soils are very strongly acid or strongly acid.

Of minor extent in this map unit are Elrose, Kirvin, Larue, Oakwood, and Tenaha. Elrose soils are on foot slopes. Kirvin soils are on small, gently sloping knolls and ridges. Larue soils are on ridges. Oakwood soils are on the broader, smoother ridges. Tenaha soils are on side slopes in a complex with Cuthbert soils.

The soils of this map unit are used mainly as woodland. In some areas, they are used as pasture or hayland. These soils generally are not used as cropland.

The dominant commercial trees are loblolly pine, shortleaf pine, and southern red oak. Steepness of slope and the clayey subsoil are the main limitations for woodland use and management. In most woodland areas, the native understory is grazed by livestock and game animals.

Most of the pasture and hay is improved bermudagrass and bahiagrass. Legumes, such as arrowleaf clover, crimson clover, and vetch, overseeded into the grass, extend the grazing season and improve the soil. Fertilizer and lime are needed to maintain yields.

Steepness of slope, shrinking and swelling of the subsoil, and restricted permeability limit the use of these soils for urban development. Roads and structures should be designed to prevent slippage downslope. Structures can be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields can be designed to overcome the restricted permeability, but care must be taken to prevent effluent seeping to the surface downslope.

Soils of the Bottom Lands

This group of general soil map units makes up about 13 percent of Leon County. The major soils are Gladewater, Hatliff, Kaufman, and Nahatche (fig. 5). These soils developed in loamy and clayey sediments of Recent age. The landscape is nearly level flood plains along rivers and streams. Native grasses are bluestem, switchgrass, gamagrass, panicum, and paspalum, as well as sedges. Trees are predominantly oak, elm, cottonwood, and pecan.

Soils in this group are subject to flooding and are wet for extended periods. Areas of these soils that are only occasionally flooded are suitable for corn, cotton, and grain sorghum. Nitrogen and phosphorus fertilizers are needed for good yields. Suitable pasture plants are improved bermudagrass and Dallisgrass.

Because of the flooding hazard, these soils should not be used as homesites.

9. Hatliff-Nahatche

Nearly level, deep, loamy soils that are moderately well drained and somewhat poorly drained

In this map unit, the landscape typically is nearly level flood plains of streams in all parts of the county. Vertical relief is mainly less than 5 or 10 feet within a distance of 1 mile. The soils formed in recent sediment from nearby sources, which are mainly of the Claiborne Group.

This map unit makes up about 9 percent of the county. It is about 69 percent Hatliff soils, 17 percent Nahatche soils, and 14 percent soils of minor extent.

Hatliff soils are on nearly level and slightly wavy natural levees along streams and other better drained parts of flood plains. These soils are moderately well drained. Typically, the surface layer is brownish fine sandy loam. The underlying material is stratified brownish and grayish fine sandy loam and loamy fine sand. These soils are slightly acid or neutral.

Nahatche soils are in the lower and wetter areas, commonly backwater parts of the flood plains. These soils are somewhat poorly drained. Typically, the surface layer is brownish loam. The underlying material is brownish loam in the upper part and grayish clay loam in the lower part. These soils are slightly acid or neutral.

Of minor extent in this map unit are Gladewater, Gowker, Nugent, Pickton, and Wolfpen soils. Gladewater and Gowker soils are on the flood plains where the streams merge with the flood plains of the rivers. Gladewater soils are in the lower, wetter areas, and Gowker soils are in the better drained, slightly higher areas. Nugent soils are on elongated, low ridges. Pickton and Wolfpen soils are on uplands along the flood plains.

The soils of this map unit are used as pasture, hayland, rangeland, or woodland. They generally are not used as cropland because of flooding and wetness.

Most of the pasture and hay is improved bermudagrass and bahiagrass. Legumes, such as white clover, vetch, and singletary peas, grow well. Fertilizer and lime are needed for sustained yields. Wetness and the hazard of flooding are limitations for use as pasture or hayland.

These soils are used as rangeland in the western part of the county. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees along with woody shrubs and vines.

In some areas, these soils are used as woodland. Hardwood trees, such as sweetgum, water oak, and willow oak, are dominant. Loblolly pine also grows well. In woodland areas, the native understory is grazed by livestock and game animals.

Because of the flooding and wetness, areas of these soils are not recommended as homesites.

10. Gladewater-Kaufman

Nearly level, deep, clayey soils that are very poorly drained to somewhat poorly drained

In this map unit, the landscape typically is nearly level flood plains of the Navasota and Trinity Rivers. Vertical relief is mainly less than 10 feet within a distance of 1 mile. The soils formed in recent clayey sediment from sources upriver outside the county. The

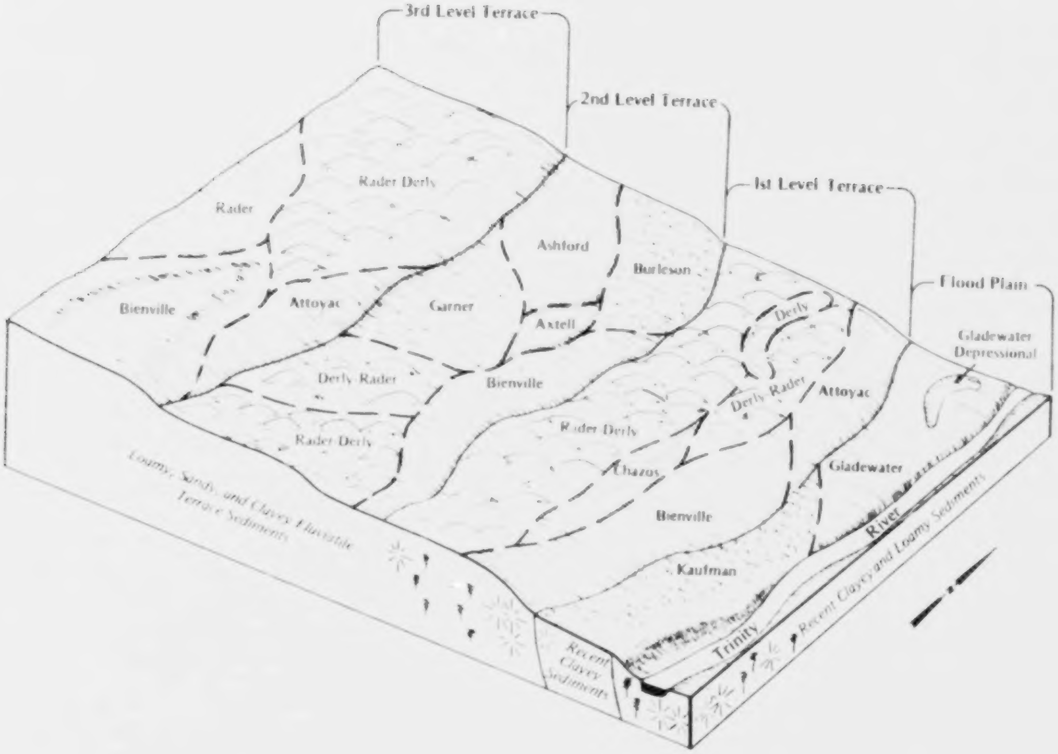
3rd Level Terrace
2nd Level Terrace
1st Level Terrace
Flood Plain
Rader
Rader Derly
Ashford
Burleson
Bienville
Attoyac
Garner
Axtell
Derly
Gladewater Depressional
Derly Rader
Bienville
Rader Derly
Derly Rader
Attoyac
Rader Derly
Chazos
Gladewater
Bienville
Kaufman
Trinity
River
Recent Clayey and Loamy Sediments
Loamy, Sandy, and Clayey Fluviatile Terrace Sediments
Recent Clayey Sediments

Figure 5.—The Gladewater, Hatliff, Kaufman, and Nahatche soils are dominant on the terraces and flood plains of the Trinity River system.

sediment is mainly from soils formed in Cretaceous limestone and marl with only small amounts of other material.

This map unit makes up about 4 percent of the county. It is about 61 percent Gladewater soils, 33 percent Kaufman soils, and 6 percent soils of minor extent.

Gladewater soils are on nearly level bottom lands. They are poorly drained except in slightly depressional backwater areas where they are very poorly drained. Typically, the surface layer is brownish clay, the subsoil is grayish clay, and the substratum is gray clay. These soils are slightly acid in the surface layer and subsoil and moderately alkaline in the substratum.

Kaufman soils are on nearly level bottom lands in slightly higher positions than those of the Gladewater soils. Kaufman soils are somewhat poorly drained. Typically, the surface layer is gray or black clay. The subsoil is gray clay that has light olive brown mottles. These soils are slightly acid in the surface layer and moderately alkaline in the subsoil.

Of minor extent in this map unit are Gowker, Nahatche, and Nugent soils. These soils are mainly near the mouth of local streams where less clayey sediment has been deposited on the river flood plain. Generally, these soils are slightly higher on the landscape than the Gladewater and Kaufman soils.

The soils of this map unit are used as pasture, hayland, rangeland, or woodland. In a few areas, they are used for crops.

Most of the pasture and hay is improved bermudagrass, common bermudagrass, and

Dallisgrass. Suitable legumes are white clover and vetch. Nitrogen and phosphorus fertilizers are needed for sustained yields.

The rangeland is a tall grass savannah with a 30 percent canopy of hardwood trees along with woody vines and shrubs.

These soils are used as woodland in a few areas. The better trees are water oak, willow oak, cottonwood, elm, and sycamore. The understory plants are grazed by livestock and game animals.

Suitable crops in the occasionally flooded areas of these soils are cotton, corn, grain sorghum, soybeans, and small grains. Wetness and the clayey texture are limitations for cropland use. In most areas, frequent flooding prevents economical crop production.

Flooding, wetness, high shrink-swell potential, restricted permeability, and the clayey texture limit the use of these soils for urban development. Areas of these soils are not recommended as homesites.

Soils of the Terraces

This group of general soil map units makes up about 9 percent of Leon County. The Attoyac, Bienville, Burleson, Derly, Garner, and Rader soils are dominant in this group. These soils developed in fluviatile terrace deposits ranging from clay to sand. The landscape is mainly nearly level to gently sloping, but it is strongly sloping along beveled edges of terraces. Native grasses are bluestem, switchgrass, indiangrass, paspalum, uniola, panicum, and wildrye, as well as sedges. Trees are predominantly oak, sweetgum, elm, and hackberry.

Most soils in this group are well suited to crops, such as cotton, corn, soybeans, grain sorghum, and small grains. Fertilizer and lime are needed for good yields. Improved bermudagrass and bahiagrass are suitable pasture plants.

Most areas of these soils that overlook the Trinity River valley are good homesites. Precautions should be taken, however, because some soils are wet and the shrink-swell potential is high.

11. Rader-Attoyac-Derly

Nearly level to strongly sloping, deep, loamy soils that are moderately well drained, well drained, and poorly drained

In this map unit the landscape typically is broad, nearly level to gently undulating, mounded terraces that have strongly sloping, beveled side slopes. Drainage is poorly defined. Vertical relief is mainly less than 30 feet within a distance of less than 1 mile. The underlying material is interbedded loamy and clayey fluviatile terrace deposits from local sources. The surface has been partly reworked by wind. The terraces range from 10 to 75 feet above the river flood plain.

This map unit makes up about 6 percent of the county. It is 37 percent Rader soils, 23 percent Attoyac soils, 17 percent Derly soils, and 23 percent soils of minor extent.

Rader soils are on nearly level to gently undulating mounds mainly in a complex with Derly soils. The Rader soils are moderately well drained. Typically, the surface and subsurface layers are brownish fine sandy loam. The subsoil is brownish sandy clay loam in the upper part and grayish clay in the lower part. These soils are slightly acid in the surface and subsurface layers, strongly acid in the upper part of the subsoil, and neutral to moderately alkaline in the lower part.

Attoyac soils are in broad, nearly level to gently sloping areas and on strongly sloping, beveled side slopes between terrace levels. These soils are well drained. Typically, the surface layer is brownish fine sandy loam. The subsoil is red sandy clay loam. These soils are medium acid in the surface layer and strongly acid in the subsoil.

Derly soils are in nearly level, small depressional areas and intermounds mainly in a complex with Rader soils. The Derly soils are poorly drained. Typically, the surface layer is brownish silt loam. The subsurface layer is grayish silt loam. The subsoil is clay that is brownish in the upper part and grayish in the lower part. These soils are medium acid to neutral.

Of minor extent in this map unit are Ashford, Axtell, Bienville, Chazos, Cuthbert, Garner, Hatliff, and Woodtell soils. Ashford and Garner soils are in low, smooth, wet areas. Axtell soils are on beveled side slopes below Rader soils. Bienville and Chazos soils are on sandy ridges. Cuthbert and Woodtell soils are on upland side slopes that merge into the terrace. Hatliff soils are on flood plains of small streams.

The soils of this map unit are used mostly as pasture or hayland. In some areas, they are used as cropland, woodland, or rangeland.

Most of the pasture and hay is common or improved bermudagrass. Clover, vetch, and singletary peas, overseeded into the grasses, lengthen the grazing season and improve the soil. Fertilizer and lime are needed for sustained production.

Suitable crops for the smoother, better drained areas of these soils are cotton, corn, peanuts, grain sorghum, small grains, and watermelons. Fertilizer and lime are necessary for the best yields.

The rangeland plants are tall grasses in an oak savannah.

In the few areas managed as woodland, the dominant trees are loblolly pine, shortleaf pine, southern red oak, and sweetgum. Wetness and the clayey subsoil are restrictions in places. In most woodland areas, the native understory is grazed by livestock and game animals.

Wetness, shrinking and swelling, and very slow permeability of the Rader and Derly soils limit the use of these soils for urban development. Roads and structures can be designed to compensate for the shrinking and swelling of the clayey subsoil. Septic tank absorption fields can be designed to overcome the restricted permeability, or sewage lagoons can be used.

12. Bienville

Nearly level to gently sloping, deep, sandy soils that are somewhat excessively drained

In this map unit, the landscape typically is broad, nearly level to gently sloping, sandy terraces. Drainage is poorly defined, and most rainfall enters the deep, loose sand. Vertical relief is mainly less than 25 feet within a distance of less than 1 mile. The underlying material is sandy fluviatile terrace deposits from local sources. The surface has been partly reworked by wind. The terraces range from 25 to 50 feet above the river flood plain.

This map unit makes up about 2 percent of the county. It is 78 percent Bienville soils and 22 percent soils of minor extent.

Bienville soils are sandy to a depth of more than 80 inches. Typically, the surface and subsurface layers are brownish loamy fine sand. The subsoil is loamy fine sand that is reddish in the upper part and brownish in the lower part. These soils are medium acid.

Of minor extent in this map unit are Attoyac, Cuthbert, Derly, Rader, and Woodtell soils. Attoyac soils are in smooth areas and on beveled side slopes between terrace levels. Cuthbert and Woodtell soils are on upland side slopes that merge into the terrace. Derly and Rader soils are in a complex pattern of mounds and depressions.

The soils of this map unit are used mostly as pasture or hayland. In some areas, they are used as cropland or woodland. These soils are well suited to these uses.

Most of the pasture and hay is improved bermudagrass and weeping lovegrass. The main limitation for use as pasture and hayland is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, lengthen the grazing season and improve the soil.

The main crops are corn, peanuts, sweet potatoes, and watermelons. Fertilizer and lime are needed for good yields.

The dominant commercial trees are loblolly pine, shortleaf pine, and southern red oak. The native understory is grazed by livestock and game animals.

The loose, permeable sand limits the use of these soils for urban development. The sand can be confined under structures to prevent failure. Seepage of effluent or other contaminants into the underground water is a serious hazard.

13. Burleson-Garner

Nearly level to gently sloping, deep, clayey soils that are moderately well drained and poorly drained

In this map unit, the landscape typically is broad, nearly level to gently sloping terraces. Drainage is poorly defined. Most rainfall runs off the crusty surface of these dense, clayey soils so slowly that the soils are wet for extended periods. Vertical relief is mainly less than 20 feet within a distance of 1 mile. The underlying material is clayey fluviatile deposits from sources upriver outside the county. These deposits are mainly from soils formed in Cretaceous limestone and marl with only small amounts of other material. The terraces range from 30 to 75 feet above the river flood plain.

This map unit makes up about 1 percent of the county. It is 39 percent Burleson soils, 30 percent Garner soils, and 31 percent soils of minor extent.

Burleson soils are mostly in broad, slightly convex areas on terraces. These soils are moderately well drained. Typically, the surface layer is grayish clay. The subsoil is gray clay in the upper part and brownish clay in the lower part. It has yellowish brown mottles. These soils are slightly acid in the surface layer and mildly alkaline or moderately alkaline in the subsoil.

Garner soils are mostly on broad planes of terraces. These soils are poorly drained. Typically, the surface layer is grayish clay. The subsoil is grayish clay that has brown mottles in the upper part and yellowish brown mottles in the lower part. These soils are slightly acid in the surface layer and medium acid in the subsoil.

Of minor extent in this map unit are Ashford, Axtell, Cuthbert, Derly, and Rader soils. Ashford soils are in low, smooth, wet areas. Axtell soils are on beveled side slopes of terraces. Cuthbert soils are on upland side slopes that merge into the terrace. Derly and Rader soils are in a complex pattern of mounds and depressions.

The soils of this map unit are used mostly as pasture or hayland. In some areas, they are used as cropland or rangeland, and a few areas are woodland.

Most of the pasture and hay is improved bermudagrass and bahiagrass. The main legumes are arrowleaf clover, white clover, and vetch. The main limitations for use as pasture and hayland are wetness and the dense, clayey soil. Nitrogen and phosphate fertilizers are needed for best yields.

Suitable crops are corn, cotton, grain sorghum, and small grains. Wetness and the dense clayey soil are limitations for cropland use. The soils are crusty and droughty at times during the summer.

The range plants are a tall grass prairie with a few elm and hackberry trees.

Woodlands are mainly hardwoods, such as water oak, willow oak, post oak, southern red oak, and elm. The understory is grazed by livestock and game animals.

The very slow permeability, high shrink-swell potential, wetness, and dense clayey texture limit the use of these soils for urban development. It is expensive to build roads and structures to withstand the shrinking and swelling of these soils. Septic tank absorption fields fail in these wet, very slowly permeable soils. Sewage lagoons are a better method of handling effluent.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hearne fine sandy loam, 1 to 5 percent slopes, is one of several phases in the Hearne series.

Some map units are made up of two or more major soils. These map units are called soil complexes or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Crockett-Wilson complex, 1 to 3 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Kaufman and Gladewater soils, frequently flooded, is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

ArC—Arenosa fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping to undulating, and somewhat excessively drained. It is on broad uplands. The areas of this soil are irregular in shape and range from 10 to 800 acres.

Typically, the surface layer is slightly acid, yellowish brown fine sand about 6 inches thick. The underlying material to a depth of 84 inches is medium acid fine sand. It is pink to a depth of 52 inches and grades to very pale brown below that depth.

Permeability is very rapid, and the available water capacity is low. Runoff is very slow. Water erosion is a slight hazard. Soil blowing is a severe hazard in bare areas and at construction sites.

Included with this soil in mapping are small areas of Padina and Silstid soils, both on a landscape similar to that of the Arenosa soil. Also included are Arenosa soils that have slopes of more than 8 percent. The included soils make up less than 15 percent of the map unit.

This Arenosa soil is used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitations for rangeland are droughtiness and low available water capacity (fig. 6).

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are droughtiness, low available water capacity, and the loose, sandy surface layer. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil generally is not used for crops because of droughtiness, low available water capacity, the sandy surface layer, and steepness of slope.

This soil is well suited to roads, streets, and buildings. In areas where slope is more than 4 percent, the use of this soil as sites for small commercial buildings is limited. The very rapidly permeable sand is a poor filter for sewage effluent.

This Arenosa soil is in capability subclass IVs and in the Very Deep Sand range site.

As—Ashford clay loam, 0 to 1 percent slopes. This soil is deep, nearly level, and poorly drained. It is on broad, smooth ancient terraces. The areas of this soil are irregular in shape and range from 25 to 900 acres.

Typically, the surface layer is strongly acid, dark grayish brown clay loam about 5 inches thick. The subsoil to a depth of 42 inches is very strongly acid, light brownish gray clay that has brownish yellow mottles. To a depth of 80 inches, it is strongly acid, light brownish gray clay that has yellowish brown mottles.

Permeability is very slow, and the available water capacity is high. Runoff is very slow. Erosion is not a problem. A perched high water table is within 1 foot of the surface during winter and spring. Ponding is common in places.

Included with this soil in mapping are areas of Axtell, Derly, Garner, and Rader soils. Derly and Garner soils are in positions similar to those of the Ashford soil. Axtell and Rader soils are on slightly higher landscapes. The included soils make up 5 to 10 percent of the map unit.

This Ashford soil is used mainly as woodland. It is better suited to hardwoods than to pines. The dominant trees are post oak, water oak, willow oak, and southern red oak. The main limitations for woodland use are wetness and the dense clayey subsoil. Seasonal wetness hampers harvesting operations, and the dense clayey subsoil causes a high rate of seedling mortality. Plant competition and a rapid increase in the overstory canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are longleaf uniola, broomsedge bluestem, little bluestem, beaked panicum, sedges, and greenbrier.

In a few areas, this soil is used as pasture or hayland. Bahiagrass is the main forage. Suitable legumes are white clover and subterranean clover. The main limitations for use as pasture or hayland are wetness and the dense clayey subsoil. Fertilizer and lime are needed for sustained yields. A surface drainage system can also increase pasture yields and the number of suitable plants.

This soil is too poorly drained for most cultivated crops grown in the area. A drainage system, fertilizer, and lime are needed for significant yields.

This soil is poorly suited to use as sites for dwellings, roads, streets, and sanitary facilities. The main limitations are wetness and the shrinking and swelling of the soil with changes in moisture content. Low strength is a limitation for roads and streets. Very slow permeability and wetness are limitations for septic tank absorption fields.

This Ashford soil is in capability subclass IVw. The woodland ordination symbol is 4W.

AtB—Attoyac fine sandy loam, 0 to 3 percent slopes. This soil is deep, nearly level to gently sloping, and well drained. It is on broad, smooth stream terraces. The areas of this soil are irregular in shape and range from 10 to 120 acres.

Typically, the surface layer is medium acid, yellowish brown fine sandy loam about 12 inches thick. The subsoil to a depth of 72 inches is strongly acid, red sandy clay loam. It has a few small pockets of uncoated sand below a depth of 38 inches.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. The erosion hazard is slight.

Included with this soil in mapping are areas of Bienville, Chazos, Derly, and Rader soils. Bienville and Chazos soils are in positions similar to those of the Attoyac soil. Derly soils are in small depressions, mostly in areas of less than 2 acres. Rader soils are on mounds. Also included is a soil similar to the Attoyac soil except the surface layer is loamy fine sand. The included soils make up about 15 percent of the map unit.

This Attoyac soil is used mostly as woodland and is well suited to this use. The dominant trees are loblolly

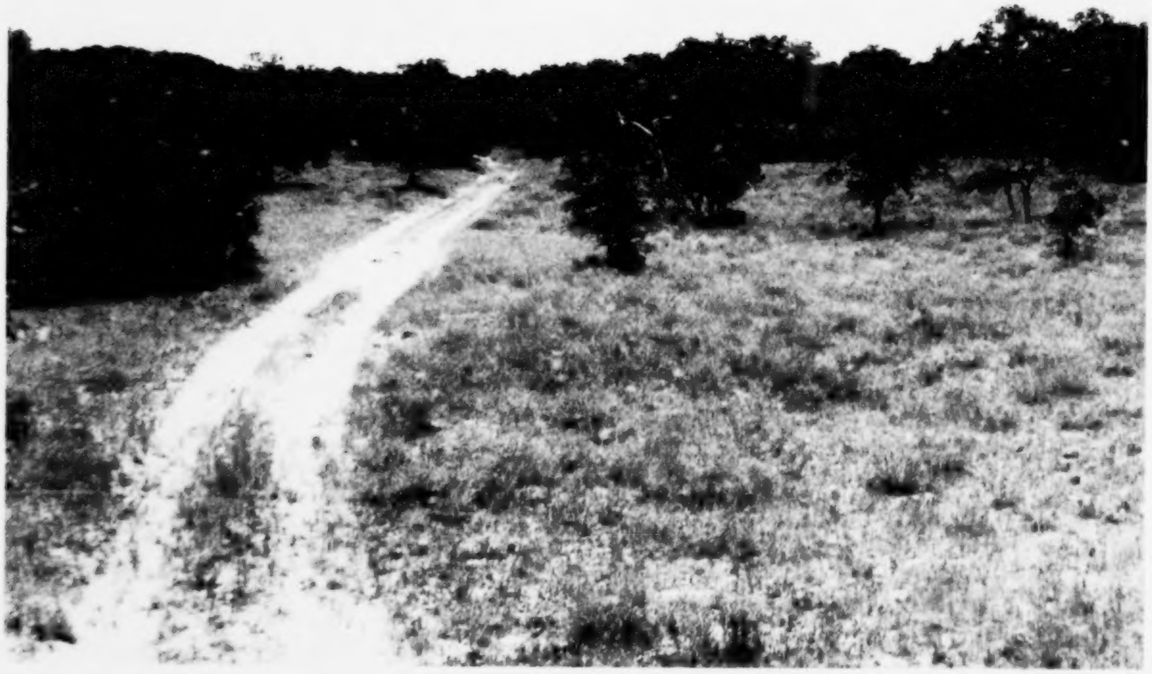

Figure 6.—Production of native and improved grasses is limited on droughty soils, such as Arenosa fine sand, 1 to 8 percent slopes.

pine, shortleaf pine, southern red oak, and sweetgum. Plant competition and rapid increases in the tree canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, pineywoods dropseed, yaupon, and greenbrier.

This soil is used as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

In a few areas, this soil is used for crops. It is well suited to corn, cotton, peanuts, watermelons, and small grains. Fertilizer and lime are necessary for high yields. Cover crops, high residue crops, and green manure crops help maintain fertility.

This soil is well suited to dwellings, roads, streets, and sanitary facilities. Low strength is a limitation for roads and streets.

This Attoyac soil is in capability subclass IIe. The woodland ordination symbol is 9A.

AtD—Attoyac fine sandy loam, 3 to 12 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is on side slopes between terrace levels. The areas of this soil are long and narrow and range from 10 to 450 acres.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 13 inches thick. The subsoil to a depth of 32 inches is strongly acid, red sandy clay loam. To a depth of 72 inches, it is strongly acid, yellowish red sandy clay loam. It becomes less clayey with depth. To a depth of 80 inches, the soil is strongly acid, reddish yellow sandy loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is medium. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Axtell, Bienville, and Woodtell soils. Axtell, Bienville, and Woodtell soils are in positions similar to those of the Attoyac soil. Also included are soils similar to the Attoyac soil; one has a loamy fine sand surface layer and another has sandy loam within 60 inches of the surface. The included soils make up about 20 percent of the map unit.

This Attoyac soil is used mostly as woodland. Pine and hardwood trees grow well on this soil. The dominant trees are loblolly pine, shortleaf pine, southern red oak, and sweetgum. Plant competition and a rapid increase in the overstory canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, pineywoods dropseed, yaupon, and greenbrier.

This soil is used as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

Steepness of slope and the hazard of water erosion limit the use of this soil for crops.

Steepness of slope is a limitation for dwellings, roads, streets, and sanitary facilities. Low strength is an additional limitation for roads and streets.

This Attoyac soil is in capability subclass IVe. The woodland ordination symbol is 9A.

AxA—Axtell fine sandy loam, 0 to 1 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on uplands and old terraces. The areas of this soil are oblong to irregular in shape and range from 10 to 590 acres.

Typically, the surface layer is strongly acid, brown fine sandy loam about 3 inches thick. The subsurface layer to a depth of 9 inches is strongly acid, pale brown fine sandy loam. The subsoil to a depth of 26 inches is strongly acid, red clay that has gray and yellowish brown mottles. To a depth of 58 inches, it is medium acid, gray clay that has mottles in shades of red, brown, and yellow. The substratum to a depth of 80 inches is neutral, brownish yellow sandy clay loam.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. Erosion is not a hazard.

Included with this soil in mapping are areas of Crockett, Lufkin, Rader, and Tabor soils. Crockett and Tabor soils are in positions similar to those of the Axtell soils. Lufkin and Rader soils are in slightly lower positions. The included soils make up less than 15 percent of the map unit.

This Axtell soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil is suited to crops, such as cotton, corn, grain sorghum, and wheat, but growth is restricted by the dense clayey subsoil. The soil is droughty during the summer, and the surface is crusty when dry. Fertilizer is needed.

The main limitations for dwellings, roads, streets, and sanitary facilities are the very slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is a limitation for roads and streets.

This Axtell soil is in capability subclass IIIs and in the Claypan Savannah range site.

AxB—Axtell fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on uplands and old terraces. The areas of this soil are mostly oblong to irregular in shape and range from about 10 to 600 acres.

Typically, the surface layer is strongly acid, dark grayish brown fine sandy loam about 4 inches thick. The subsurface layer to a depth of 8 inches is strongly acid, grayish brown fine sandy loam. The subsoil to a depth of 18 inches is strongly acid, yellowish red clay that has reddish and grayish mottles. To a depth of 30 inches, it is strongly acid, yellowish brown clay that has reddish and grayish mottles, and to a depth of 35 inches, it is medium acid, brownish yellow clay that has grayish and reddish mottles. The next layer to a depth of 41 inches is slightly acid, light yellowish brown clay that has grayish mottles. To a depth of 80 inches, the substratum is mildly alkaline, light yellowish brown clay, that has grayish mottles.

Permeability is very slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Crockett, Lufkin, Rader, and Tabor soils. Crockett and Tabor soils are in positions similar to those of the Axtell soil. Lufkin and Rader soils are in slightly lower positions. The included soils make up less than 15 percent of the map unit.

This Axtell soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

Although this soil is not used as cropland, crops, such as corn and cotton, have been grown in some areas. The main limitation is the dense clayey subsoil. The soil is also droughty during the summer, and the surface is crusty when dry. Terraces, contour farming, grassed waterways, and crop residue help to control erosion. Fertilizer increases yields.

The main limitations for dwellings, roads, streets, and sanitary facilities are steepness of slope, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Axtell soil is in capability subclass IVe and in the Claypan Savannah range site.

AxD—Axtell fine sandy loam, 5 to 12 percent slopes. This soil is deep, strongly sloping, and moderately well drained. It is on old terraces and uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 10 to 1,100 acres.

Typically, the surface layer is medium acid, brown fine sandy loam about 4 inches thick. The subsoil to a depth of 26 inches is strongly acid, yellowish red clay that has gray mottles. To a depth of 76 inches, it is strongly acid, yellowish brown clay that has gray mottles. The substratum to a depth of 80 inches is neutral, brownish yellow sandy clay loam that has brown and gray mottles.

Permeability is very slow, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Crockett and Tabor soils. These soils are in positions similar to those of the Axtell soil. Also included are soils similar to the Axtell soil except they have a gravelly surface layer. The included soils make up less than 15 percent of the map unit.

This Axtell soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

The limitations for dwellings, roads, streets, and sanitary facilities are steepness of slope, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Axtell soil is in capability subclass VIe and in the Claypan Savannah range site.

BeB—Benchley clay loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on broad smooth uplands and on lower side slopes adjacent to streams. The areas of this soil are oblong to elongated and range from 10 to 1,000 acres.

Typically, the surface layer is slightly acid, very dark gray clay loam about 13 inches thick. The subsoil to a depth of 18 inches is medium acid, very dark gray clay that has yellowish red mottles. To a depth of 51 inches, it is medium acid, red clay that has light olive brown and grayish brown mottles. The next layer to a depth of 60 inches is slightly acid, light olive brown clay that has gray and yellowish red mottles. The substratum to a depth of 80 inches is slightly acid, strong brown stratified shale and weakly cemented sandstone.

Permeability is slow, and the available water capacity is high. Runoff is slow to medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Crockett, Dimebox, Mabank, and Wilson soils. Crockett and Dimebox soils are in slightly higher positions than the Benchley soil. Mabank and Wilson soils are in positions similar to those of the Benchley soil. Also included are soils similar to the Benchley soil; one has a loam or sandy clay loam surface layer and another has slightly steeper slopes and a dark surface layer less than 10 inches thick. The included soils make up less than 15 percent of the map unit.

This Benchley soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. White clover is also a suitable legume. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

In some areas, this soil is also used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil is well suited to crops, such as cotton, corn, grain sorghum, and small grains. Cover crops, terraces, and contour farming are needed to reduce erosion. Fertilizer is needed for best yields.

The major limitations for dwellings, roads, streets, and sanitary facilities are slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Benchley soil is in capability subclass IIIe and in the Clay Loam range site.

BeD—Benchley clay loam, 5 to 8 percent slopes. This soil is deep, strongly sloping, and moderately well drained. It is on lower side slopes on uplands adjacent to streams. The areas of this soil are oblong to elongated and range from 15 to 300 acres.

Typically, the surface layer is slightly acid, very dark grayish brown clay loam about 14 inches thick. The subsoil to a depth of 18 inches is slightly acid, dark brown clay that has red and very dark gray mottles. The next layer to a depth of 44 inches is slightly acid or neutral, yellowish red clay. It has reddish brown mottles in the upper part and very dark gray and olive brown mottles in the lower part. To a depth of 55 inches, the soil is moderately alkaline, brownish yellow clay that has yellowish red mottles. The substratum to a depth of 80 inches is moderately alkaline, calcareous, brownish yellow and yellowish brown stratified shale and weakly cemented sandstone. It has very pale brown mottles.

Permeability is slow, and the available water capacity is high. Runoff is medium. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Crockett, Dimebox, Mabank, and Wilson soils. Crockett and Dimebox soils are in slightly higher positions than the Benchley soil. Mabank and Wilson soils are in smoother, less sloping positions on the landscape. Also included is a soil similar to the Benchley soil except the surface layer is loam or sandy clay loam. The included soils make up less than 15 percent of the map unit.

This Benchley soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. White clover is also a suitable legume. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

In some areas, this soil is used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil has been used for crops, such as cotton, corn, and grain sorghum. It could also be used for small grains. Steepness of slope is a limitation, and erosion is a hazard. Cover crops, terraces, and contour farming are needed to reduce erosion.

The major limitations for dwellings, roads, streets, and sanitary facilities are steepness of slope, slow permeability, and shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Benchley soil is in capability subclass IVe and in the Clay Loam range site.

BnB—Bienville loamy fine sand, 0 to 3 percent slopes. This soil is deep, nearly level to gently sloping, and somewhat excessively drained. It is on broad, smooth stream terraces. Soils are oblong to elongated in shape and range from 10 to 1,250 acres.

Typically, the surface layer is dark brown loamy fine sand about 12 inches thick. The subsurface layer to a depth of 16 inches is dark brown loamy fine sand. To a depth of 80 inches, the soil is loamy fine sand that is yellowish red in the upper part and strong brown in the lower part. It has spots and streaks of clean sand grains. This soil is medium acid.

Permeability is moderately rapid, and the available water capacity is moderate. Runoff is slow. Soil blowing is a hazard in bare areas and at construction sites. Water erosion is not a problem. A high water table is at a depth of 4 to 6 feet in winter and spring.

Included with this soil in mapping are areas of Attoyac, Chazos, Derly, Nugent, and Rader soils. Attoyac, Chazos, and Rader soils are in positions similar to those of the Bienville soil. Derly soils are in small depressions. Nugent soils are on flood plains. Also included is a soil similar to the Bienville soil except the surface layer is fine sand. The included soils make up less than 15 percent of the map unit.

This Bienville soil is used mainly as woodland and is well suited to this use. The dominant trees are loblolly pine, shortleaf pine, and southern red oak. Pine seedling mortality caused by droughtiness is a concern in management. Low natural fertility and droughtiness limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, pineywoods dropseed, longleaf uniola, purple lovegrass, American beautyberry, yaupon, and blackberry.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is well suited to crops, such as corn, peanuts, sweet potatoes, and watermelons (fig. 7). Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops also help maintain fertility.

This soil is well suited to roads, streets, and buildings. Seepage and the high water table are limitations in some areas.

This Bienville soil is in capability subclass IIs. The woodland ordination symbol is 10S.

BuA—Burleson clay, 0 to 1 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on broad, smooth ancient stream terraces. The areas of this soil are broad and elongated and are 5 to 875 acres.

Typically, the surface layer is slightly acid, very dark gray clay about 19 inches thick. The subsoil to a depth of 48 inches is mildly alkaline, gray clay that has yellowish brown mottles. To a depth of 72 inches, it is moderately alkaline, grayish brown clay that has yellowish brown mottles.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Erosion is not a hazard.

Included with this soil in mapping are areas of Ashford and Garner soils on similar landscapes. The included soils make up less than 15 percent of the map unit.

This Burleson soil is used mainly as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

In some areas, this soil is used as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. The dense clayey soil is difficult to work, especially in preparing a seedbed. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

This soil is suited to crops, such as corn, cotton, grain sorghum, and small grains. Seasonal wetness and the dense clayey texture are limitations.

The major limitations for dwellings, roads, streets, and sanitary facilities are wetness, very slow permeability, the clay texture, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Burleson soil is in capability subclass IIw and in the Blackland range site.

BuB—Burleson clay, 1 to 3 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on broad ancient stream terraces. The areas of this soil are oblong to elongated and are 5 to 480 acres.

Typically, the surface layer is black clay about 21 inches thick. The subsoil to a depth of 42 inches is dark gray clay that has grayish brown mottles. To a depth of 51 inches, it is dark grayish brown clay that has dark gray mottles. The next layer to a depth of 80 inches is grayish brown clay that has yellowish brown mottles. This soil is moderately alkaline.

Permeability is very slow, and the available water capacity is high. Runoff is medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Garner and Wilson soils, which are in similar positions

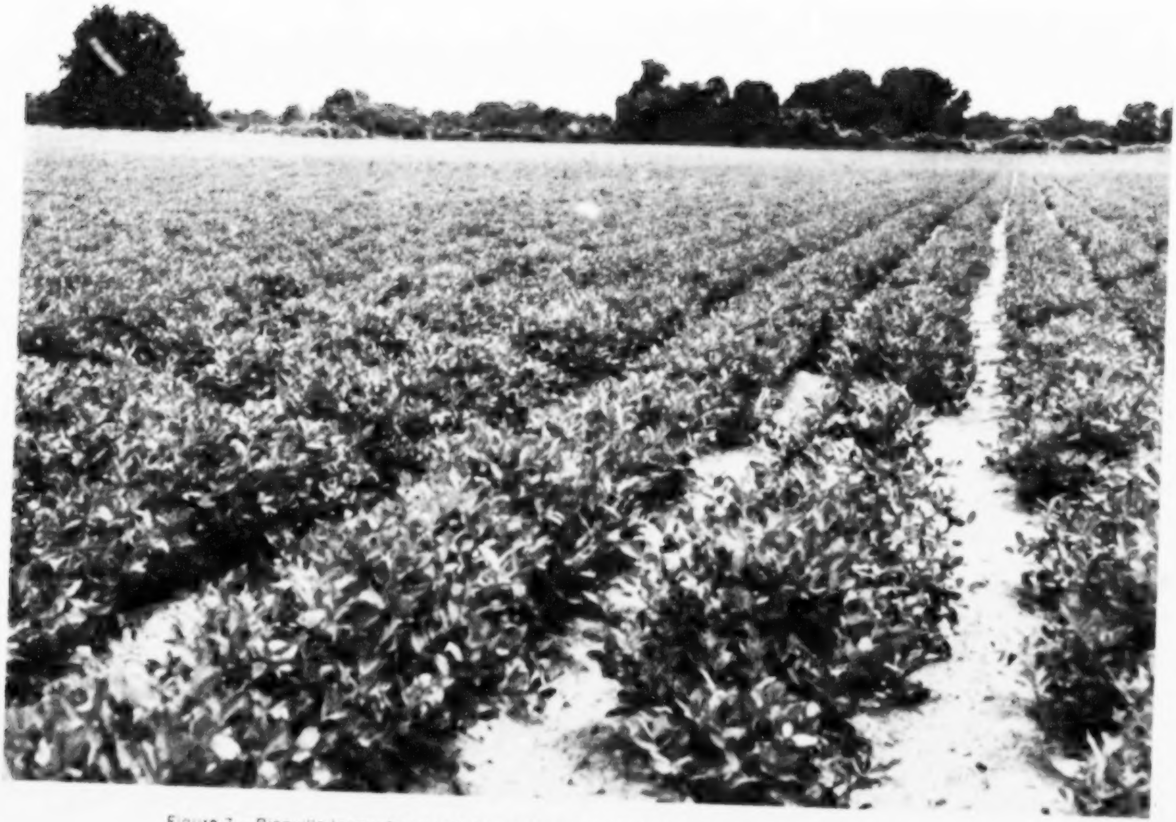

Figure 7.—Bienville loamy fine sand, 0 to 3 percent slopes, is well suited to crops, such as peanuts.

on the landscape. The included soils make up less than 15 percent of the map unit.

This Burleson soil is used mainly as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

In some areas, this soil is used as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas overseeded into the grass, prolong the growing season and improve the soil. The dense clayey soil is difficult to work, especially in preparing a seedbed. Nitrogen and phosphorus are needed to sustain forage yields.

This soil is suited to crops, such as corn, cotton, grain sorghum, and small grains. Terraces, contour farming, grassed waterways, and crop residue can help control erosion.

The major limitations for dwellings, roads, streets, and sanitary facilities are very slow permeability, the clayey texture, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Burleson soil is in capability subclass IIe and in the Blackland range site.

ChB—Chazos loamy fine sand, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on stream terraces. The areas of this soil are irregular in shape and range from 10 to 375 acres.

Typically, the surface layer is slightly acid, dark brown loamy fine sand about 8 inches thick. The subsurface layer to a depth of 17 inches is slightly acid, light yellowish brown loamy fine sand. The subsoil to a depth of 40 inches is slightly acid, mottled light brownish gray, red, and reddish yellow sandy clay. To a depth of 48 inches, it is medium acid, brownish yellow sandy clay loam that has grayish and reddish mottles, and to a depth of 68 inches, it is medium acid, brownish yellow sandy clay loam that has grayish mottles. The substratum to a depth of 80 inches is slightly acid, light brownish gray clay that has yellowish mottles.

Permeability is slow, and the available water capacity is moderate. Runoff is slow. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and at construction sites.

Included with this soil in mapping are areas of Attoyac, Axtell, Derly, and Rader soils. Attoyac and Rader soils are in positions similar to those of the Chazos soil. Axtell soils are in slightly lower positions, and Derly soils are in small depressions. The included soils make up less than 15 percent of the map unit.

This Chazos soil is used mainly as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil is also used as pasture or hayland. Improved bermudagrass, bahiagrass, and weeping lovegrass are the main forage. A complete fertilizer is required for sustained forage production. Legumes, such as arrowleaf clover, crimson clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is suited to crops, such as corn, cotton, grain sorghum, peanuts, and watermelons. Fertilizer is needed for better production. Water erosion and soil blowing can be reduced by proper use of crops and residue.

The major limitations for dwellings, roads, and streets are slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. Slow permeability restricts the use of this soil for sanitary facilities.

The Chazos soil is in capability subclass IIIe and in the Sandy Loam range site.

CrB—Crockett fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on broad, smooth uplands. The areas of this soil are irregular in shape and range from 5 to 700 acres.

Typically, the surface layer is medium acid, yellowish brown fine sandy loam about 7 inches thick. The subsoil to a depth of 18 inches is medium acid, yellowish brown clay that has olive yellow mottles. To a depth of 26 inches, it is neutral, mottled red and olive yellow clay. To a depth of 63 inches, the subsoil is moderately alkaline clay. It is light olive brown with yellowish red mottles to a depth of 37 inches and olive brown below that depth. To a depth of 80 inches, the soil is moderately alkaline, olive yellow brown clay.

Permeability is very slow, and the available water capacity is high. Runoff is medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Axtell, Benchley, Dimebox, Lufkin, Mabank, Tabor, and Wilson soils. Axtell, Benchley, Dimebox, and Wilson soils are in positions similar to those of the Crockett soil. Lufkin, Mabank, and Tabor soils are in slightly lower positions. The included soils make up less than 15 percent of the map unit.

This Crockett soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. The main limitation for use as pasture and hayland is the dense clayey subsoil. Fertilizers are needed to sustain forage yields. This soil is droughty in the summer.

In some areas, this soil is also used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil is suited to crops, such as cotton, grain sorghum, and small grains. Cover crops, terraces, and contour farming are needed to reduce the erosion hazard. This soil is droughty during the summer, and the surface is crusty when dry.

The main limitation for dwellings, roads, and streets is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. The very slow permeability is a limitation for septic tank absorption fields.

This Crockett soil is in capability subclass IIIe and in the Claypan Prairie range site.

CrD—Crockett fine sandy loam, 5 to 10 percent slopes. This soil is deep, strongly sloping, and moderately well drained. It is on side slopes on uplands. The areas of this soil are long and narrow and range from 5 to 230 acres.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 6 inches thick. The subsoil to a depth of 13 inches is medium acid, yellowish red clay that has red mottles. To a depth of 47 inches, it is neutral, olive yellow clay that has grayish brown mottles. To a depth of 80 inches, the soil is mildly alkaline, light brownish gray clay that has shale fragments.

Permeability is very slow, and the available water capacity is high. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Axtell and Benchley soils. Axtell soils are in positions similar to those of the Crockett soil. Benchley soils are on lower side slopes. Also included is a soil similar to the Crockett soil except the surface layer is clay loam. The included soils make up less than 15 percent of the map unit.

This Crockett soil is used mainly as pasture or hayland. Improved bermudagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas overseeded into the grass, prolong the grazing season and improve the soil. The main limitations are the dense clayey subsoil, steepness of slope, and droughtiness. Fertilizers are needed to sustain forage yields.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil is not used for crops because of the steepness of slope and the severe hazard of erosion.

The main limitations for dwellings, roads, streets, and sanitary facilities are steepness of slope, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Crockett soil is in capability subclass VIe and in the Claypan Prairie range site.

CsB—Crockett-Wilson complex, 1 to 3 percent slopes. These soils are deep and gently sloping. Crockett soil is moderately well drained, and Wilson soil is somewhat poorly drained. These soils are in broad smooth areas on uplands. The areas of these soils are irregular in shape and range from 10 to 1,060 acres.

This complex is about 57 percent Crockett soil, 29 percent Wilson soil, and 14 percent other soils. Areas of these soils are so intricately mixed that it is not practical to map them separately at the selected scale. Crockett and Wilson soils occur in the same position on the landscape in an irregular pattern, which is best observed on a freshly plowed field.

Included with this complex in mapping are small areas of Benchley and Dimebox soils. Benchley soils are on lower side slopes adjacent to streams. Dimebox soils are in positions similar to those of the Crockett and Wilson soils.

Typically, the Crockett soil has a medium acid, dark brown loam surface layer about 6 inches thick. The subsoil to a depth of 19 inches is medium acid, red clay that has yellow and brown mottles. To a depth of 70 inches, the soil is medium acid to moderately alkaline, brownish yellow clay that has brown, gray, and red mottles. To a depth of 80 inches, it is moderately alkaline, light brownish gray clay that has yellowish brown mottles.

Typically, the Wilson soil has a slightly acid, very dark gray loam surface layer about 6 inches thick. The subsoil to a depth of 17 inches is slightly acid, very dark gray clay that has yellowish brown mottles. To a depth of 42 inches, it is slightly acid, dark gray clay that has brown and red mottles. To a depth of 60 inches, the soil is neutral, olive brown clay that has dark gray mottles, and to a depth of 80 inches, it is moderately alkaline clay that is brownish yellow with gray and yellowish red mottles in the upper part and light brownish gray with yellowish brown mottles in the lower part.

The Crockett and Wilson soils are very slowly permeable, and the available water capacity is high. Runoff is medium. Water erosion is a moderate hazard.

The Crockett and Wilson soils in this map unit are used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. Fertilizer is needed to sustain forage yields. Droughtiness reduces forage in the summer.

These soils are also used as rangeland and are well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

These soils are suited to crops, such as cotton, corn, grain sorghum, and small grains. Cover crops, terraces, and contour farming are needed to reduce the hazard of erosion. These soils are droughty during the summer, and the surface is crusty when dry.

The main limitations for dwellings, roads, streets, and sanitary facilities are very slow permeability and shrinking and swelling of these soils with changes in moisture content. Low strength is an additional limitation for roads and streets. Wetness is an additional limitation of the Wilson soil.

The Crockett and Wilson soils in this complex are in capability subclass IIIe and in the Claypan Prairie range site.

CuE—Cuthbert fine sandy loam, 5 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 1,360 acres.

Typically, the surface layer is strongly acid, dark brown fine sandy loam about 2 inches thick. The subsurface layer to a depth of 6 inches is very strongly acid, light yellowish brown fine sandy loam. The subsoil to a depth of 16 inches is very strongly acid, yellowish red clay. The next layer to a depth of 24 inches is very strongly acid, reddish yellow clay loam mottled with red and light gray shale. The substratum to a depth of 60 inches is very strongly acid, red, reddish yellow, and pinkish gray stratified sandstone and shale.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Kirvin and Tenaha soils. Kirvin soils are on a more level landscape than the Cuthbert soil. Tenaha soils are on lower side slopes. Also included are some Cuthbert soils that have a loamy fine sand surface layer and soils similar to the Cuthbert soil except they are less than 20 inches thick. Stones are on the surface in a few places. The included soils make up less than 15 percent of the map unit.

This Cuthbert soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, and bahiagrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, and vetch, overseeded into the grass, prolong the grazing season and improve the soil (fig. 8). The main limitations for use as pasture and hayland are steepness of slope and the dense clayey subsoil. Fertilizer and lime are needed to maintain yields.

This soil is also used as woodland. It is moderately suited to the production of pine and hardwood trees. The main limitations for woodland use are steepness of slope and the clayey subsoil. Erosion is a hazard in woodland areas. Dominant trees are loblolly pine, shortleaf pine, and some mixed hardwoods. The dense clayey subsoil and droughtiness limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, splitbeard bluestem, yellow indiangrass, pineywoods dropseed, longleaf uniola, yaupon, and greenbrier.

This soil is not suited to use as cropland because of steepness of slope and the severe hazard of erosion.

This soil is poorly suited to use as sites for buildings, roads, streets, and sanitary facilities because of shrinking and swelling of the subsoil and steepness of slope. Low strength is an additional limitation for roads and streets.

This Cuthbert soil is in capability subclass VIe. The woodland ordination symbol is 8C.

CxE—Cuthbert fine sandy loam, 5 to 20 percent slopes, stony. This soil is deep, strongly sloping to moderately steep, and well drained. It is on uplands. Large stones and boulders of iron-enriched sandstone cover 5 to 10 percent of the surface. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 100 acres.

Typically, the surface layer is strongly acid, fine sandy loam about 9 inches thick. It is brown in the upper part and pale brown in the lower part. The subsoil to a depth of 35 inches is strongly acid, red clay. It has yellowish brown mottles below a depth of 15 inches. The substratum to a depth of 38 inches is very strongly acid, yellowish red sandy clay loam that is underlain by indurated ironstone.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Kirvin and Tenaha soils. Kirvin soils are on a more level landscape than the Cuthbert soil. Tenaha soils are on lower side slopes. Also included are soils similar to the Cuthbert soil except they are less than 20 inches thick. Some areas have been mined for ironstone gravel, and all of the topsoil and a large part of the stones have been removed. The included soils make up less than 15 percent of the map unit.

This Cuthbert soil is used mainly as woodland, but it is poorly suited to this use. Stoniness is the major limitation for the production of pine and hardwood trees. Steepness of slope and droughtiness are also limitations. Dominant trees are loblolly pine, shortleaf pine, and mixed hardwoods. The dense clayey subsoil, steepness of slope, and stoniness limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, low panicums, American beautyberry, yaupon, and greenbrier.

This soil is used for the production of pasture or

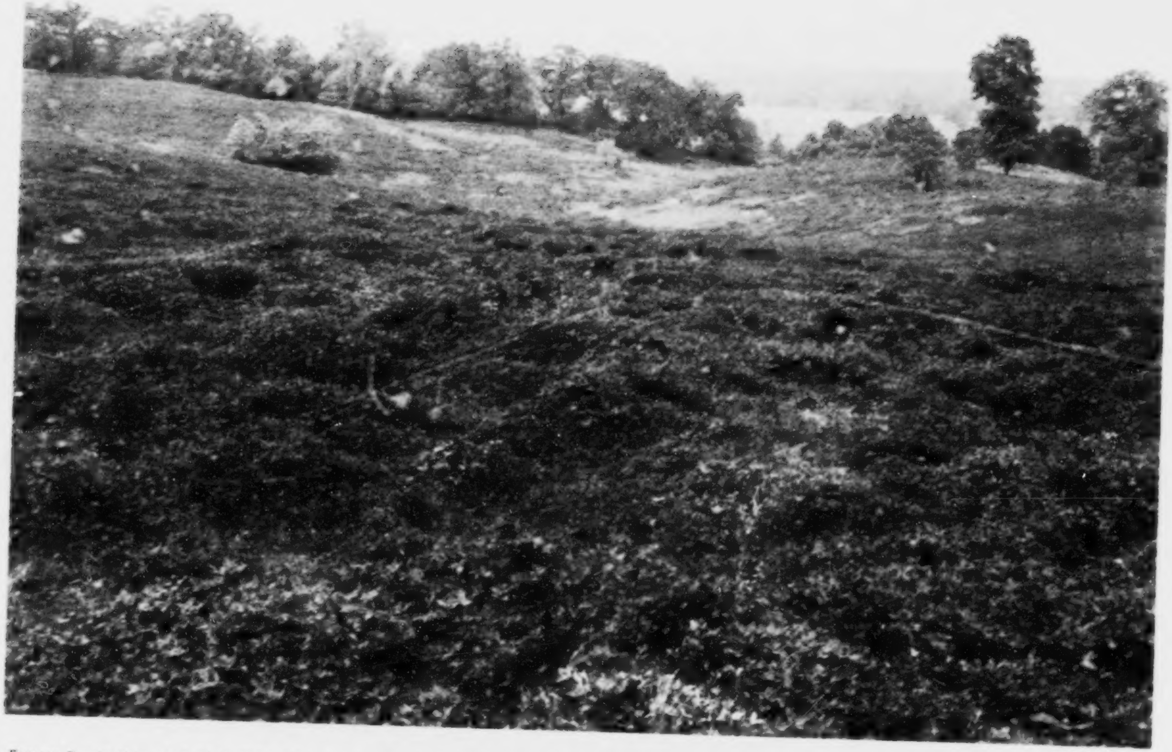

Figure 8.—In this area of Cuthbert fine sandy loam, 5 to 20 percent slopes, arrowleaf clover overseeded in coastal bermudagrass offers quality forage in spring and early in summer.

hayland plants in a few areas. The limitations for this use are the dense clayey subsoil, large stones on the surface, and steepness of slope.

This soil is not suited to use as cropland because of stones, steepness of slope, and the severe hazard of erosion.

This soil is poorly suited to buildings, roads, streets, and sanitary facilities because of steepness of slope and large stones. Low strength is an additional limitation for roads and streets.

This Cuthbert soil is in capability subclass VIIs. The woodland ordination symbol is 6F.

De—Derly silt loam, 0 to 1 percent slopes. This soil is deep, nearly level, and poorly drained. It is in small depressional areas on ancient stream terraces. The areas of this soil are oblong to elongated and range from 5 to 180 acres.

Typically, the surface layer is slightly acid, dark brown silt loam about 8 inches thick. The subsurface layer to a depth of 13 inches is medium acid, light brownish gray silt loam. The subsoil to a depth of 40 inches is medium acid to neutral, grayish brown clay that has tongues and interfingerings of light brownish gray to white silt loam and very fine sandy loam. To a depth of 80 inches, the soil is neutral, light brownish gray clay.

Permeability is very slow, and the available water capacity is high. Runoff is slow to ponded. A perched high water table is within 1 foot of the surface from fall to spring, and ponding occurs during periods of high rainfall (fig. 9).

Included with this soil in mapping are areas of Ashford, Attoyac, Bienville, Gasil, and Rader soils. Ashford soils are in positions similar to those of the Derly soil. Attoyac, Bienville, Gasil, and Rader soils are on a slightly higher landscape. The included soils make up less than 15 percent of the map unit.

This Derly soil is used as woodland in some areas, but it is poorly suited to this use. The dominant trees are water oak, willow oak, and sweetgum. The main limitation for woodland use is wetness. In woodland areas, wetness, the dense clayey subsoil, and an increased overstory canopy reduce the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, Florida paspalum, beaked panicum, Virginia wildrye, and sedges.

This soil is also used as pasture or hayland. Wetness is the main limitation. Common bermudagrass, improved bermudagrass, bahiagrass, Dallisgrass, switchgrass, tall fescue, singletary peas, and white clover are the main grasses and legumes. Fertilizer and lime are needed for best production.

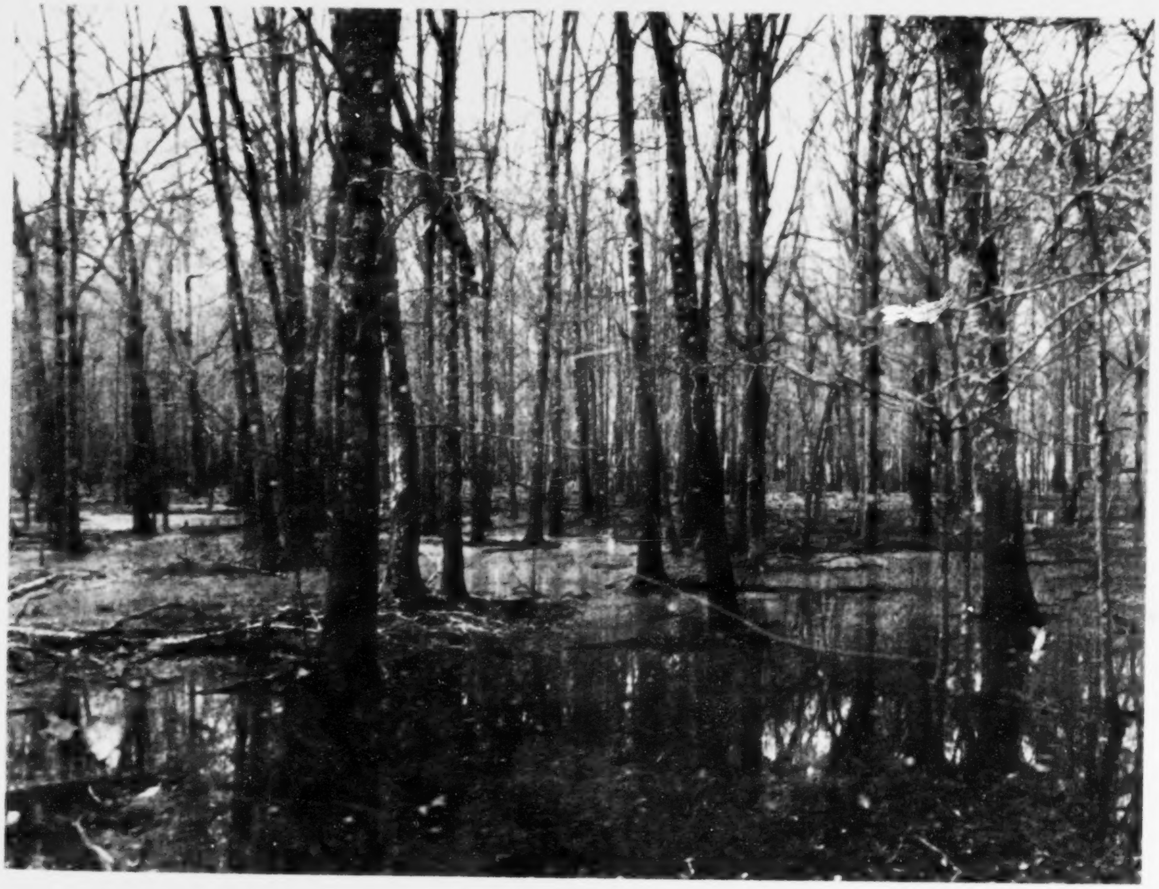

Figure 9.—Derly silt loam, 0 to 1 percent slopes, is ponded during periods of high rainfall.

Some areas of this Derly soil are used as rangeland. The climax vegetation is tall grasses and some sedges in a sparse stand of oak trees.

This soil is poorly suited to most crops because of wetness.

The main limitations for dwellings, streets, roads, and sanitary facilities are wetness, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Derly soil is in capability subclass IIIw and in the Claypan Savannah range site. The woodland ordination symbol is 4W.

Df—Derly-Rader complex, gently undulating. These soils are deep and are on broad, ancient stream terraces. The Derly soil is poorly drained, and the Rader soil is moderately well drained. Slopes range from 0 to 3 percent, and the surface is mouncy. The areas of this soil are irregular in shape and range from 5 to 575 acres.

This complex is 50 percent Derly soil, 35 percent Rader soil, and about 15 percent other soils. Areas of these soils are too intricately mixed or too small to be mapped separately at the selected scale. The Derly soil is in the low, nearly level, intermound areas. Rader soil is on round to oblong mounds about 1 to 3 feet in height and 30 to 200 feet in diameter.

Included with this complex in mapping are small areas of Ashford soils in the low, intermound areas.

Typically, the Derly soil has a medium acid silt loam surface layer about 8 inches thick. It is very dark grayish brown in the upper part and light brownish gray in the lower part. To a depth of 15 inches, the soil is medium acid, light brownish gray silty clay loam that has about 20 percent tongues and interfingering of light gray silt loam. To a depth of 80 inches, the soil is slightly acid, grayish clay that has varying amounts of red, yellow, and brown mottles.

Typically, the Rader soil has a slightly acid, fine sandy loam surface layer about 23 inches thick. It is brown in the upper part and light yellowish brown in the lower part. To a depth of 31 inches, the soil is strongly acid, yellowish brown sandy clay loam that has pockets and streaks of light yellowish brown fine sandy loam. The next layer to a depth of 42 inches is strongly acid, mottled red, gray, and yellow clay loam. To a depth of 64 inches, the soil is strongly acid, mottled red, gray, and yellow clay, and to a depth of 80 inches, it is medium acid, brownish yellow sandy clay loam that has streaks of light gray fine sandy loam.

The Derly and Rader soils are very slowly permeable and have slow runoff. The available water capacity is high in the Derly soil and moderate in the Rader soil. These soils have a perched high water table during periods of high rainfall. Water erosion is a slight hazard.

These soils are used as woodland in some areas, but they are poorly suited to tree production. The dominant trees are water oak, willow oak, sweetgum, and southern red oak. Loblolly and shortleaf pines grow in some areas of the Rader soil. The main limitation for woodland use is wetness. Wetness, the dense clayey subsoil, and an increased overstory canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, Florida paspalum, beaked panicum, Virginia wildrye, and sedges.

These soils are also used as pasture or hayland. Wetness is the main limitation. Common bermudagrass, improved bermudagrass, bahiagrass, Dallisgrass, switchgrass, tall fescue, singletary peas, arrowleaf clover, and white clover are the main forage. Fertilizer and lime are needed for best production.

These soils are used as rangeland in some areas. The climax vegetation is tall grasses and some sedges in a sparse stand of oak trees.

Because of wetness, these soils are poorly suited to most crops.

The main limitations for dwellings, roads, streets, and sanitary facilities are wetness, very slow permeability, and the shrinking and swelling of the soils with changes in moisture content. Low strength is an additional limitation for roads and streets.

The Derly and Rader soils are in capability subclass IIIw. The Derly soil is in the Claypan Savannah range site, and the Rader soil is in the Sandy Loam range site. The woodland ordination symbol is 4W for the Derly soils and 8Wb for the Rader soil.

DmA—Dimebox silty clay, 0 to 1 percent slopes. This soil is deep, nearly level, and moderately well drained. It is on broad, smooth uplands. The areas of this soil are oblong to irregular in shape and range from 5 to 335 acres.

Typically, the surface layer is very strongly acid, very dark gray silty clay about 4 inches thick. The next layer to a depth of 33 inches is medium acid, black clay. The subsoil to a depth of 71 inches is moderately alkaline clay. It is very dark gray in the upper part and olive yellow in the lower part. The next layer to a depth of about 83 inches is mildly alkaline, gray clay that has mottles in shades of yellow and brown. The substratum

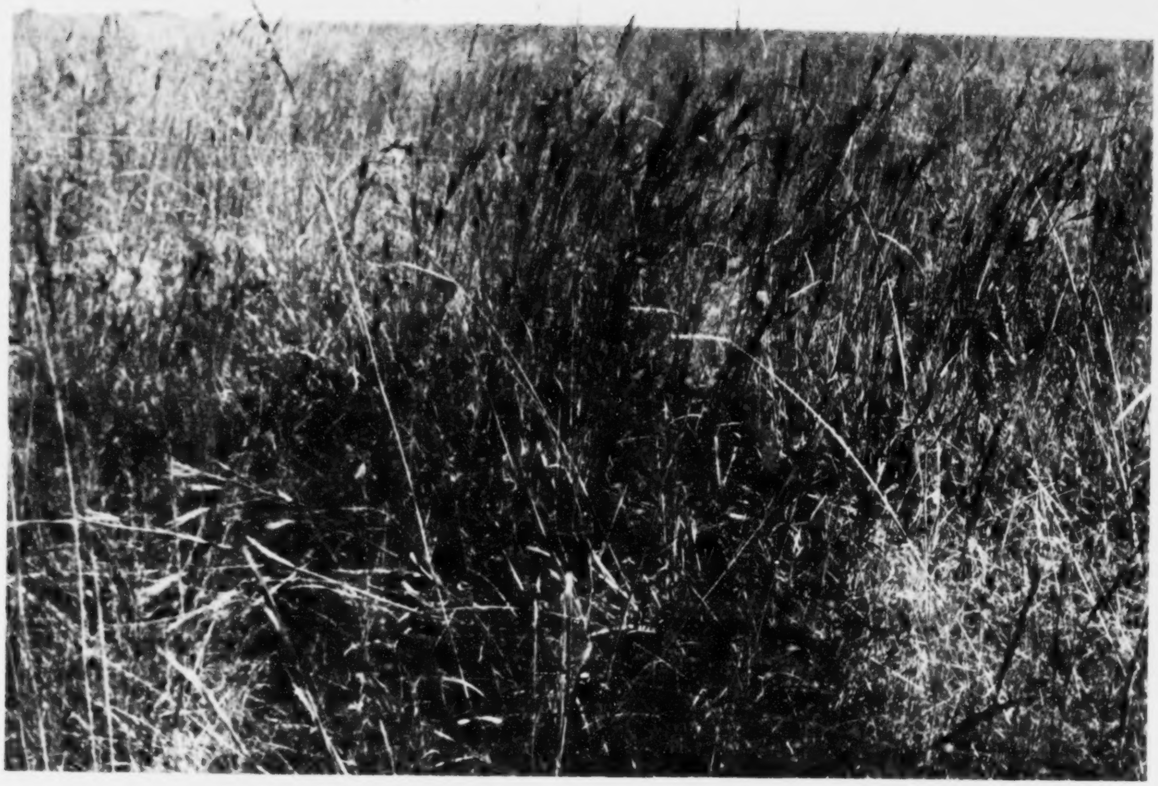

Figure 10.—The climax vegetation on Dimebox silty clay, 0 to 1 percent slopes, is a tall grass prairie. Big bluestem, little bluestem, and indiangrass once covered large areas of Leon County and provided quality grazing.

to a depth of about 91 inches is moderately alkaline, calcareous, brownish yellow clay that has mottles in shades of gray.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Water enters the dry, cracked soil rapidly and the moist soil very slowly. Water erosion is a slight hazard.

Included with this soil in mapping are areas of Benchley, Crockett, and Wilson soils. These soils are in positions similar to those of the Dimebox soil. Also included are Dimebox soils that have slopes of 1 to 3 percent. The included soils make up less than 15 percent of the map unit.

This Dimebox soil is used mainly as cropland and is well suited to this use. Cotton and grain sorghum are well adapted to this soil. Crop residue left on the surface helps to maintain tilth and the content of organic matter. Including cover plants in the crop rotation is also beneficial.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways (fig. 10).

This soil is used as pasture or hayland in some areas. Common bermudagrass, improved bermudagrass, bahiagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas overseeded into the grass, prolong the growing season and improve the soil. The dense clayey soil is difficult to work, especially in preparing a seedbed. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

The limitations for dwellings, roads, streets, and sanitary facilities are very slow permeability and shrinking and swelling of the subsoil. Low strength is an additional limitation for roads and streets.

This Dimebox soil is in capability subclass IIw and in the Blackland range site.

DuC—Dutek loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is on broad uplands and high stream terraces. The areas of this soil are oblong to irregular in shape and range from 5 to 155 acres.

Typically, the surface layer is pale brown loamy fine sand about 4 inches thick. The subsurface layer to a depth of 31 inches is light yellowish brown loamy fine sand. The subsoil to a depth of 51 inches is yellowish red sandy clay loam. The substratum to a depth of 84 inches is reddish yellow fine sandy loam in the upper part and very pale brown loamy fine sand in the lower part. This soil is medium acid.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a moderate hazard, and soil blowing is a severe hazard if the soil is left bare.

Included with this soil in mapping are areas of Padina and Silstid soils. The Padina soils have a mottled red, yellow, and gray subsoil. Silstid soils have a more yellow subsoil than the Dutek soil. The included soils make up less than 15 percent of the map unit.

This Dutek soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitation for rangeland use is droughtiness.

This soil is generally not used for crops because of droughtiness and the hazard of erosion. This soil is suited to peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops help control erosion and maintain fertility.

This soil is well suited to dwellings, roads, streets, and sanitary facilities.

This Dutek soil is in capability subclass IIIe and in the Sandy range site.

ErC—Elrose fine sandy loam, 3 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is in small upland areas. The areas of this soil are oblong to irregular in shape and range from 5 to 145 acres.

Typically, the surface layer is slightly acid, reddish brown fine sandy loam about 8 inches thick. The next layer to a depth of 18 inches is medium acid, red sandy loam. The subsoil extends to a depth of 80 inches. It is medium acid, red sandy clay loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Bub, Cuthbert, Kirvin, Larue, Trawick, and Wolfpen soils. The Bub and Trawick soils are in the highest positions on the landscape and have steep side slopes. The Cuthbert and Kirvin soils are in higher positions than the Elrose soil, and they have a clayey subsoil. The Larue and Wolfpen soils have a loamy fine sand surface layer more than 20 inches thick. These soils are in positions similar to those of the Elrose soil. Also included are soils similar to the Elrose soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Elrose soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as woodland. Pine and hardwood trees grow well on this soil. Dominant trees are loblolly pine, shortleaf pine, sweetgum, and southern red oak. Plant competition limits the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, pineywoods dropseed, brownseed paspalum, American beautyberry, yaupon, and greenbrier.

Although this soil is not used as cropland at the present time, corn and cotton have been grown on this soil in a few areas. This soil is highly susceptible to water erosion, and gullies have developed in places.

Terraces, grassed waterways, contour farming, and high residue crops help control erosion.

This soil is well suited to dwellings, streets, roads, and sanitary facilities. Steepness of slope is a limitation for some uses.

This Elrose soil is in capability subclass IIIe. The woodland ordination symbol is 9A.

EuB—Eufaula loamy fine sand, 1 to 5 percent slopes. This soil is deep, gently sloping, and somewhat excessively drained. It is on terraces. The areas of this soil are oblong to irregular in shape and range from 5 to 105 acres.

Typically, the surface layer is dark yellowish brown loamy fine sand about 9 inches thick. The subsurface layer to a depth of 51 inches is yellowish brown loamy fine sand. To a depth of 80 inches, the soil is yellowish brown sand that has thin bands of strong brown loamy fine sand. This soil is medium acid.

Permeability is rapid, and the available water capacity is low. Soil blowing is a hazard in bare areas and at construction sites. Runoff is slow. Water erosion is not a hazard.

Included with this soil in mapping are areas of Dutek, Nugent, Rader, and Silawa soils. The Dutek and Silawa soils are in higher positions on the landscape than the Eufaula soil. The Nugent soils are in lower positions and are subject to flooding. The Rader soils are in positions similar to those of the Eufaula soil. The included soils make up less than 15 percent of the map unit.

This Eufaula soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are droughtiness and low available water capacity. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitations for rangeland use are droughtiness and low available water capacity.

This soil generally is not used for crops because of droughtiness and low available water capacity.

This soil is well suited to roads, streets, and buildings. Seepage is a limitation for sanitary facilities.

This Eufaula soil is in capability subclass IVs and in the Deep Sand range site.

FeB—Ferris clay, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on ridges and in sloping areas on uplands. This soil is only mapped on the Marquez Dome. The areas of this soil are oblong to elongated and range from 25 to 225 acres.

Typically, the surface layer is very dark grayish brown clay about 3 inches thick. The subsoil to a depth of 36 inches is grayish brown clay. To a depth of 68 inches, the soil is light olive brown clay that has very dark gray mottles. This soil is calcareous and moderately alkaline.

Permeability is very slow, and the available water capacity is high. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of a soil similar to the Ferris soil except it is very dark grayish brown to a depth of more than 12 inches. The included soils make up less than 15 percent of the map unit.

This Ferris soil is used mainly as rangeland. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil is also used as pasture or hayland. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. The dense clayey soil is difficult to work, especially in preparing a seedbed. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

This soil can be used for cotton, grain sorghum, and small grains. The main limitations for crop production are the hazard of erosion and the dense clayey soil. Soil-improving cover crops, contour farming, and terraces are necessary for best production.

The main limitations for dwellings, roads, streets, and sanitary facilities are very slow permeability, the clayey texture, and shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Ferris soil is in capability subclass IIIe and in the Eroded Blackland range site.

FeD—Ferris clay, 5 to 15 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on side slopes of uplands. This soil is on the Marquez Dome in one continuous area northwest of Marquez. The area is irregular to oblong in shape.

Typically, the surface layer is very dark grayish brown clay about 4 inches thick. The subsoil to a depth of 36 inches is grayish brown clay. To a depth of 80 inches, the soil is light olive brown and light gray clay. This soil is calcareous and moderately alkaline.

Permeability is very slow, and the available water capacity is high. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of a soil similar to the Ferris soil except it is very dark grayish brown to a depth of more than 12 inches. The included soils make up less than 15 percent of the map unit.

This soil is used mainly as rangeland. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This soil is also used as pasture or hayland. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. The dense clayey soil is difficult to work, especially in preparing a seedbed. Steepness of slope is also a limitation. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

This soil is not suited to crop production because of the steep slopes and severe hazard of erosion.

The main limitations for dwellings, roads, streets, and sanitary facilities are very slow permeability, the clayey texture, steepness of slope, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Ferris soil is in capability subclass VIe and in the Eroded Blackland range site.

FoC—Flo loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and somewhat excessively drained. It is on broad ridges and side slopes on uplands. The areas of this soil are irregular to oblong in shape and range from 5 to 265 acres.

Typically, the surface layer is medium acid, brown loamy fine sand about 6 inches thick. The subsurface layer to a depth of 17 inches is strongly acid, very pale brown loamy fine sand. The subsoil to a depth of 36 inches is very strongly acid, yellowish brown loamy fine sand. To a depth of 84 inches, the soil is very strongly acid loamy fine sand that has strong brown and yellowish red fine sandy loam lamellae. The upper part of this layer is light brown, and the lower part is pink.

Permeability is rapid, and the available water capacity is low. Runoff is slow. Soil blowing is a hazard in bare areas and at construction sites. Water erosion is a slight hazard.

Included with this soil in mapping are areas of Larue, Pickton, Tonkawa, and Wolfpen soils. Larue, Pickton, and Wolfpen soils are slightly higher on broad ridges and side slopes than Flo soil. Tonkawa soils are in positions similar to those of the Flo soil and in broad, flat areas. Also included is a soil similar to the Flo soil except the surface layer is fine sand. The included soils make up less than 15 percent of the map unit.

This Flo soil is used mainly as woodland. It is moderately suited to pine and hardwood trees. The dominant trees are loblolly pine, shortleaf pine, post oak, and southern red oak. The main limitation for woodland use is low available water capacity and droughtiness. In woodland areas, the low available water capacity and droughtiness limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, splitbeard bluestem, pineywoods dropseed, slender indiangrass, purple lovegrass, longleaf uniola, and American beautyberry.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations for use as pasture or hayland are droughtiness and low available water capacity. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is poorly suited to cropland because of droughtiness and low available water capacity.

This soil is well suited to roads, streets, and buildings. Seepage is a limitation for sanitary facilities.

This Flo soil is in capability subclass IIIs. The woodland ordination symbol is 8S.

FyC—Flynn fine sandy loam, 3 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is on mid to lower side slopes on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 105 acres.

Typically, the surface layer is neutral, dark reddish brown fine sandy loam and loam about 12 inches thick. The subsoil extends to a depth of 72 inches. It is slightly acid sandy clay loam that is dark reddish brown in the upper part and dark red in the lower part. The substratum to a depth of 80 inches is slightly acid, red loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Dutek, Gasil, Hearne, Jedd, Margie, and Marquez soils. Dutek and Margie soils are in positions similar to and higher than those of the Flynn soil. Gasil and Marquez soils are in lower-lying areas. Hearne and Jedd soils are on ridgetops and upper side slopes. The included soils make up less than 20 percent of the map unit.

This Flynn soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil is not used for crops; however, it is suited to this use. Limitations are the steepness of slope and hazard of erosion.

This soil is well suited to dwellings, streets, roads, and sanitary facilities. Steepness of slope is a limitation in places.

This Flynn soil is in capability subclass IVe and in the Deep Redland range site.

GaA—Garner clay, 0 to 1 percent slopes. This soil is deep, nearly level, and poorly drained. It is in broad, smooth areas on ancient stream terraces. The areas of this soil are irregular in shape and range from 10 to 760 acres.

Typically, the surface layer is slightly acid, dark gray clay about 4 inches thick. The subsoil to a depth of 25 inches is medium acid, gray clay that has brown mottles. The lower layer to a depth of 65 inches is medium acid, light gray clay that has yellowish brown mottles.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Water erosion is not a hazard.

Included with this soil in mapping are areas of Ashford, Axtell, Burleson, and Derly soils. Ashford and Burleson soils are in positions similar to those of the Garner soil. Axtell soils are in slightly higher positions. Derly soils are in slightly lower, depressional areas. The included soils make up less than 15 percent of the map unit.

This Garner soil is used mainly as pasture or hayland. Improved bermudagrass and bahiagrass are the main forage. The main legumes are arrowleaf and white clovers. The main limitations for use as pasture or hayland are wetness and the dense clayey soil. Fertilizer and lime are needed for sustained yields.

This soil is used as woodland in a few small areas. It is moderately suited to pines and hardwoods. The main limitations for woodland use are wetness and the dense clayey soil. The dominant trees are loblolly pine, shortleaf pine, water oak, willow oak, post oak, southern red oak, and sweetgum. Wetness and the dense clayey soil limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are longleaf uniola, beaked panicum, broomsedge bluestem, little bluestem, and sedges.

This soil is poorly suited to crop production. The main limitations are wetness and the dense clayey soil. Although this soil is not used as cropland, cotton, corn, and small grains have been grown in the past.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities. The main limitations are wetness, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is also a limitation for roads and streets.

This Garner soil is in capability subclass IIIw. The woodland ordination symbol is 8Wa.

GfB—Gasil fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is in broad areas on uplands and high terraces. The areas of this soil are irregular in shape and range from 5 to 770 acres.

Typically, the surface layer is neutral, dark brown fine sandy loam about 5 inches thick. The subsurface layer to a depth of 16 inches is slightly acid, pale brown fine sandy loam. The subsoil to a depth of 72 inches is medium acid sandy clay loam. It is dark yellowish brown in the upper part and yellowish brown in the lower part. Red mottles are below a depth of 20 inches.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Erosion is a moderate hazard.

Included with this soil in mapping are areas of Flynn, Margie, Marquez, Silawa, and Silstid soils. Flynn, Margie, and Marquez soils are in slightly higher positions on the landscape than the Gasil soil. Silawa and Silstid soils are in positions similar to those of the Gasil soil. Also included is a soil similar to the Gasil soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Gasil soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used for rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

Very little of this soil is used for crops, but it is well suited to such crops as cotton, corn, grain sorghum, small grains, and watermelons (fig. 11). Terraces and contour farming are needed to reduce the hazard of erosion. Also, cover crops, high residue crops, and green manure crops help control erosion and maintain fertility. Fertilizer is needed for good yields.

This soil is well suited to sanitary facilities. Shrinking and swelling of the soil is a moderate limitation for dwellings, roads, and streets.

This Gasil soil is in capability subclass IIIe and in the Sandy Loam range site.

GfD—Gasil fine sandy loam, 5 to 8 percent slopes. This soil is deep, strongly sloping, and well drained. It is on narrow side slopes on uplands. The areas of this soil are generally narrow and elongated and range from 5 to 130 acres.

Typically, the surface layer is fine sandy loam about 11 inches thick. It is dark brown in the upper part and yellowish brown in the lower part. To a depth of 72 inches, the soil is yellowish brown sandy clay loam that has red mottles. This soil is medium acid.

Permeability is moderate, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Flynn, Hearne, Silawa, and Silstid soils. Flynn and Hearne soils are on higher side slopes than the Gasil soil. Silawa and Silstid soils are in positions similar to those of the Gasil soil. Also included is a soil similar to the Gasil soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Gasil soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used for rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crop production because of the severe hazard of erosion and steepness of slope.

This soil is well suited to sanitary facilities; however, shrinking and swelling of the soil is a moderate limitation for dwellings, roads, and streets.

This Gasil soil is in capability subclass IVe and in the Sandy Loam range site.

Gg—Gladewater clay, occasionally flooded. This soil is deep, nearly level, and poorly drained. It is on bottom lands along large streams. Areas of this soil are subject to flooding once every 2 to 10 years. Slopes are 0 to 1 percent. The areas of this soil are irregular to oblong in shape and range from 10 to 1,160 acres.

Typically, the surface layer is slightly acid, very dark gray clay about 12 inches thick. To a depth of 45 inches, the subsoil is strongly acid, dark gray clay that has brown mottles. The substratum to a depth of 80 inches is moderately alkaline, grayish brown clay.

Permeability is very slow, and the available water capacity is high. Runoff is very slow. Water erosion is a slight hazard.

Included with this soil in mapping are Kaufman soils and Gladewater clay, depressional. Kaufman soils are in positions similar to those of Gladewater clay, occasionally flooded. Gladewater clay, depressional, is in small depressions. The included soils make up about 15 percent of the map unit.

This Gladewater soil is used mainly as rangeland and is well suited to this use. The climax plant community is a tall grass savannah with a 30 percent canopy of hardwood trees along with woody vines and shrubs.

In a few areas, this soil is used as pasture or hayland. The main limitations for these uses are wetness and the dense clayey soil. Common bermudagrass, improved bermudagrass, bahiagrass, Dallisgrass, and switchgrass are the main forage. Arrowleaf, white, and subterranean clovers are suitable legumes. Fertilizer is needed for good yields.

This soil is used for crop production in a few areas. The main limitations for this use are wetness, the dense clayey soil, and the hazard of flooding. Suitable crops are cotton, soybeans, grain sorghum, and small grains.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding, wetness, the clayey texture, and shrinking and swelling with changes in moisture content.

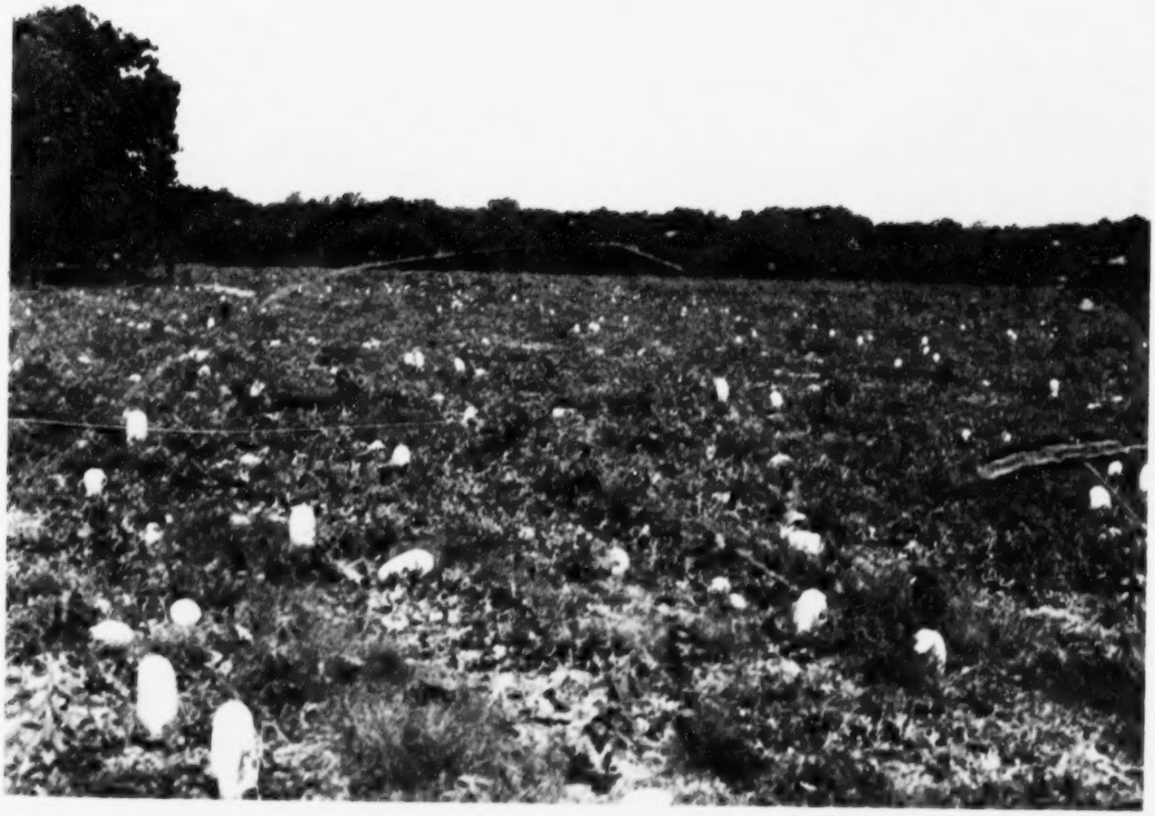

Figure 11.—Gasil fine sandy loam, 1 to 5 percent slopes, is prime farmland and is excellent for truck crops, pasture, and hay.

This Gladewater soil is in capability subclass IVw and in the Clayey Bottomland range site.

Gh—Gladewater clay, frequently flooded. This soil is deep, nearly level, and poorly drained. It is on bottom lands along large streams. This soil is subject to flooding at least once in 2 years. Slopes are 0 to 1 percent. The areas of this soil generally are long and narrow and range from 10 to 1,990 acres.

Typically, the surface layer is slightly acid, very dark grayish brown clay about 8 inches thick. The subsoil to a depth of 45 inches is slightly acid, dark gray clay. The substratum to a depth of 80 inches is moderately alkaline, gray clay.

Permeability is very slow, and the available water capacity is high. Runoff is very slow. Water erosion is only a slight hazard, but floodwaters scour channels in places.

Included with this soil in mapping are Kaufman soils and Gladewater clay, depressional. Kaufman soils are in positions similar to those of Gladewater clay, frequently flooded. Gladewater clay, depressional, is in small depressions. The included soils make up about 15 percent of the map unit.

This Gladewater soil is used mainly as rangeland and is well suited to this use. The climax plant community is a tall grass savannah with a 30 percent canopy of hardwood trees along with woody vines and shrubs.

In a few areas, this soil is used as pasture or hayland. The main limitations for these uses are wetness, the dense clayey soil, and the hazard of flooding. Common bermudagrass and Dallisgrass are the main forage. Suitable legumes are white clover and singletary peas. Fertilizer is needed for sustained yields.

This soil is not suited to crop production because of flooding.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding, wetness, the clayey texture, and shrinking and swelling of the soil with changes in moisture content.

This Gladewater soil is in capability subclass Vw and in the Clayey Bottomland range site.

Gp—Gladewater clay, depressional. This soil is deep, nearly level, and very poorly drained. It is in oxbows and depressional areas on bottom lands. This soil has water on the surface during and after periods of heavy rainfall. Slopes are 0 to 1 percent. The areas of this soil are concave and elongated and range from 5 to 125 acres.

Typically, the surface layer is medium acid, dark gray clay about 4 inches thick. To a depth of 8 inches, the soil is strongly acid, dark gray clay, and to a depth of 80 inches, it is medium acid to strongly acid, dark gray clay that has yellowish red and brownish yellow mottles.

Permeability is very slow, and the available water capacity is high. This soil is ponded for several months each year. Water erosion is not a problem.

Included with this soil in mapping are soils similar to the Gladewater soil except they have a silty clay or clay loam surface layer and have stratified textures in the lower layers. The included soils make up less than 15 percent of the map unit.

This Gladewater soil is used mainly as rangeland and is moderately suited to this use. The main limitation is wetness. The climax plant community is a tall grass savannah with a 30 percent canopy of hardwood trees.

In a few areas, this soil is used as pasture or hayland. The main limitation is wetness caused by the prolonged periods of standing water. Sedges are the main forage. White clover can be used to improve the soil. Drainage of the surface water increases yields and permits cattle to graze the area. Fertilizer is needed for sustained yields.

This soil is not suited to crop production because of the prolonged periods of wetness.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of ponding, flooding, and shrinking and swelling of the soil with changes in moisture content.

This Gladewater soil is in capability subclass VIw and in the Clayey Bottomland range site.

Gw—Gowker clay loam, frequently flooded. This soil is deep, nearly level, and moderately well drained. It is on bottom lands of the smaller streams. This soil is subject to flooding at least once in 2 years. Slopes are 0 to 1 percent. The areas of this soil are mostly long and narrow and range from 10 to 250 acres.

Typically, the surface layer is slightly acid, very dark gray clay loam about 13 inches thick. To a depth of 24 inches, it is slightly acid, very dark grayish brown clay loam. To a depth of 40 inches, the soil is neutral, dark grayish brown sandy clay loam, and to a depth of 56 inches, it is slightly acid, mottled yellowish brown and grayish brown sandy loam. The lower layer to a depth of 80 inches is medium acid, grayish brown loam that has dark yellowish brown mottles.

Permeability is slow, and the available water capacity is high. Runoff is slow. Flooding is usually of short duration; in some years it does not occur. Water erosion is not a hazard, but floodwaters scour channels in places.

Included with this soil in mapping are Gladewater, Hatliff, Kaufman, Nahatche, and Nugent soils. Gladewater and Kaufman soils are in slightly lower positions on the landscape than the Gowker soil. Hatliff and Nahatche soils are in positions similar to those of the Gowker soil. Nugent soils are in slightly higher positions. The included soils make up less than 20 percent of the map unit.

This Gowker soil is used mainly as woodland. It is well suited to hardwood trees and loblolly pine. The dominant hardwood trees are sweetgum, water oak, willow oak, southern red oak, and eastern cottonwood. Flooding is the main concern in managing this soil for timber production. The dense overstory canopy limits the production of understory plants suitable for grazing by livestock and game animals. Major understory plants are eastern gamagrass, beaked panicum, plumegrass, purpletop, Virginia wildrye, low panicums, and sedges.

This soil is also used as pasture or hayland, but flooding is a concern in management. Improved bermudagrass, common bermudagrass, and Dallisgrass are the main forage. Suitable legumes are white clover and vetch. Fertilizer is needed for sustained yields.

This soil is poorly suited to crop production because of the hazard of flooding.

In some areas, this soil is used as rangeland. It is well suited to this use. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees along with woody vines and shrubs.

This soil is poorly suited to dwellings, streets, roads, and sanitary facilities because of flooding and wetness.

This Gowker soil is in capability subclass Vw and in the Loamy Bottomland range site. The woodland ordination symbol is 11W.

Ha—Hatliff fine sandy loam, frequently flooded. This soil is deep, nearly level, and moderately well drained. It is on bottom lands. Slopes are 0 to 1 percent. This soil is subject to flooding more than once every 2 years. The areas of this soil are mostly oblong to broad and range from about 5 to 5,400 acres.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 8 inches thick. The underlying material to a depth of 72 inches is stratified, slightly acid to neutral, brownish and grayish fine sandy loam and loamy fine sand.

Permeability is moderately rapid. The available water capacity is low, but the soil is saturated with water for periods of a few days to a few weeks in winter and early in spring in most years. Runoff is slow. A high water table is within 2 feet of the surface during the winter.

Included with this soil in mapping are areas of Nahatche and Nugent soils. Nahatche soils are in positions similar to those of the Hatliff soil and they have a fine loamy control section. Nugent soils are in slightly higher positions and are sandy throughout the profile. The included soils make up less than 15 percent of the map unit.

This Hatliff soil is used mainly as woodland. It is well suited to pine trees. The dominant trees are loblolly pine, slash pine, sweetgum, water oak, and willow oak. Wetness is a limiting factor. This soil is well suited to the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, broomsedge bluestem, beaked panicum, brownseed paspalum, longleaf uniola, waxmyrtle, and greenbrier.

This soil is moderately suited to use as pasture or hayland. Wetness and the hazard of flooding are the major limitations. Improved bermudagrass and bahiagrass are the main forage. Suitable legumes are white clover, vetch, and singletary peas. Fertilizer and lime are needed for sustained yields.

This soil is poorly suited to crop production because of flooding.

In some areas, this soil is used as rangeland. It is well suited to this use. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees along with woody shrubs and vines.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding and wetness.

This Hatliff soil is in capability subclass Vw and in the Loamy Bottomland range site. The woodland ordination symbol is 9W.

HeB—Hearne fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on ridgetops on uplands. The areas of this soil are irregular to oblong in shape and range from 5 to 420 acres.

Typically, the surface layer is strongly acid fine sandy loam about 7 inches thick. It is brown in the upper part and pale brown in the lower part. The subsoil to a depth of 27 inches is strongly acid clay that is red in the upper part and yellowish red in the lower part. To a depth of 34 inches, the soil is very strongly acid, mottled yellowish red, gray, and yellow sandy clay loam. The substratum to a depth of 60 inches is very strongly acid, mottled red, gray, and yellow stratified sandstone and shale.

Permeability is slow, and the available water capacity is moderate. Runoff is medium. Erosion is a severe hazard.

Included with this soil in mapping are areas of Marquez, Padina, Robco, and Silstid soils. Marquez soils are in positions similar to those of the Hearne soil. Padina and Silstid soils are in slightly higher positions. Robco soils are in concave positions slightly lower on the landscape. The included soils make up less than 15 percent of the map unit.

This Hearne soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production. Droughtiness is a limitation.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crop production because of the severe hazard of erosion and the droughtiness.

The major limitation for dwellings, roads, and streets is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. Slow permeability restricts the use of this soil for sanitary facilities.

This Hearne soil is in capability subclass IIIe and in the Sandy Loam range site.

HeE—Hearne fine sandy loam, 5 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on long, narrow knolls and side slopes on uplands. The areas of this soil are elongated to oblong and range from 5 to 800 acres.

Typically, the surface layer is strongly acid, brown fine sandy loam about 3 inches thick. The subsurface layer to a depth of 6 inches is strongly acid, pale brown fine sandy loam. The subsoil to a depth of 26 inches is very strongly acid, yellowish red clay. The substratum to a depth of 70 inches is very strongly acid, stratified shale and sandstone.

Permeability is slow, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Marquez, Padina, and Silstid soils. Marquez soils are on ridgetops. Padina and Silstid soils are in positions similar to and slightly higher than those of the Hearne soil. Also included is a soil similar to the Hearne soil except sandstone is within 20 inches of the surface. The included soils make up less than 20 percent of the map unit.

This Hearne soil is used mostly as rangeland. The climax vegetation is tall grasses in an oak savannah.

This soil is also used as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production. Droughtiness and steepness of slope are limitations for use as pasture and hayland.

This soil is not suited to crop production because of steepness of slope and the severe hazard of erosion.

The main limitation for sanitary facilities, dwellings, and roads and streets is steepness of slope. Low strength and shrinking and swelling are additional limitations for roads and streets, and slow permeability restricts the use of this soil for sanitary facilities.

This Hearne soil is in capability subclass VIe and in the Sandy Loam range site.

HsE—Hearne fine sandy loam, 5 to 20 percent slopes, stony. This soil is deep, strongly sloping to moderately steep, and well drained. It is on long, narrow knolls and upper side slopes on uplands. Stones and boulders of sandstone cover 5 to 10 percent of the surface. The areas of this soil are irregular to oblong in shape and range from 5 to 530 acres.

Typically, the surface layer is strongly acid, yellowish brown fine sandy loam about 7 inches thick. The subsoil to a depth of 28 inches is very strongly acid, mottled red and gray clay. To a depth of 60 inches, the substratum is stratified sandstone, shale, and ironstone rock.

Permeability is slow, and the available water capacity is low. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Hearne soils that do not have stones on the surface or in the surface layer and a soil similar to the Hearne soil except it has gravel on the surface or in the surface layer. The included soils make up less than 20 percent of the map unit.

This Hearne soil is used mainly as rangeland. It is poorly suited to use as rangeland, but this is the best use of this soil. The main limitation is large stones on the surface. The climax vegetation is mid and tall grasses in an oak savannah.

This soil is not suited to crop or pasture production. The main limitations are the large stones on the surface and the hazard of erosion because of steepness of slope.

The main limitations for dwellings, streets, roads, and sanitary facilities are steepness of slope and the large stones on the surface. Low strength and shrinking and swelling of the soil are additional limitations for roads and streets. Slow permeability restricts the use of this soil for sanitary facilities.

This Hearne soil is in capability subclass VIIs and in the Sandstone Hills range site.

HxE—Hearne fine sandy loam, graded, 5 to 20 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on uplands. The surface layer of this soil has been removed as a source of gravel for road construction. Piles of gravel are scattered over the surface, and there are bare spots of clay. The areas of this soil generally are convex but are not in a regular pattern and are not uniform. They range from 5 to 50 acres.

Typically, the surface layer is very strongly acid, light reddish brown fine sandy loam about 3 inches thick. The subsoil to a depth of 36 inches is very strongly acid, red clay. To a depth of 40 inches, the soil is very strongly acid, yellowish red sandy clay loam. The substratum to a depth of 60 inches is stratified, extremely acid, brown sandy loam, shale, and sandstone.

Permeability is slow, and the available water capacity is low. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Marquez gravelly fine sandy loam. These soils are in positions similar to those of the Hearne soil and also have had the surface layer removed. The included soils make up less than 15 percent of the map unit.

This Hearne soil is used mainly as rangeland. The quality of the rangeland is poor. Most areas of this soil are idle because the surface layer has been removed and fertility is low.

This soil is poorly suited to use as pasture or hayland unless intensive reclamation measures are used. Fertilizer and lime are necessary for best production of improved bermudagrass and bahiagrass. The main limitations for use as pasture or hayland are the rough gravelly surface and the low fertility.

This soil is not suited to cultivated crops. The main limitations are the severe hazard of erosion, steepness of slope, and the low fertility.

The main limitations for dwellings, roads, streets, and sanitary facilities are steepness of slope and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Hearne soil is in capability subclass VIe and in the Sandstone Hills range site.

JmE—Jedd-Margie complex, 5 to 25 percent slopes. These soils are moderately deep and deep and are well drained. They are on side slopes on uplands. Jedd soil has slopes of 12 to 25 percent, and Margie soil has slopes of 5 to 12 percent. The areas of this soil are long and narrow and range from 5 to 600 acres.

This complex is 50 to 60 percent Jedd soil, 30 to 40 percent Margie soil, and 10 percent other soils. Some areas contain about 10 percent cobbles and stones on the surface.

Typically, the Jedd soil has a neutral, brown gravelly sandy loam surface layer about 3 inches thick. The subsoil to a depth of 28 inches is very strongly acid, yellowish red clay that has yellowish brown mottles in the lower part. The next layer to a depth of 34 inches is strongly acid, strong brown clay and weathered glauconitic material. The substratum to a depth of 60 inches is neutral, weathered glauconitic material and glauconitic greensand.

Typically, the Margie soil has a neutral, dark reddish brown loam surface layer about 5 inches thick. The subsoil to a depth of 23 inches is medium acid, red clay. To a depth of 34 inches, it is medium acid, yellowish red clay. The next layer to a depth of 52 inches is slightly acid, brownish yellow clay. The substratum to a depth of 80 inches is slightly acid, yellowish brown stratified sandstone with weathered glauconitic material and shale.

The Jedd and Margie soils have moderately slow permeability, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this complex in mapping are small areas of Flynn soils on foot slopes. A few areas of Jedd soils that are eroded and a few areas of soils that have slopes of more than 25 percent are also included.

The Jedd and Margie soils are used mainly as rangeland. They are poorly suited to use as rangeland, but it is their best use. The main limitation is steepness of slope. The climax vegetation is mid and tall grasses in an oak savannah.

These soils are poorly suited to use as pasture or hayland because of steepness of slope and the hazard of erosion.

These soils are not suited to crops because of the severe hazard of erosion and the steepness of slope.

The main limitation for dwellings, streets, roads, and sanitary facilities is steepness of slope. Low strength is an additional limitation for roads and streets.

The Jedd and Margie soils are in capability subclass VIe. The Jedd soil is in the Sandstone Hills range site, and the Margie soil is in the Deep Redland range site.

Ka—Kaufman clay, occasionally flooded. This soil is deep, nearly level, and somewhat poorly drained. It is on bottom lands along large streams. This soil is subject to flooding once every 2 to 15 years. Slopes are 0 to 1 percent. The areas of this soil are elongated and range from 85 to 750 acres.

Typically, the surface layer is slightly acid, very dark gray clay about 8 inches thick. To a depth of 70 inches, the soil is slightly acid, black clay. The subsoil to a depth of 80 inches is moderately alkaline, dark gray clay that has mottles of light olive brown.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Water enters the soil rapidly when the surface is dry and cracked and enters it very slowly when the soil is wet and the cracks have swelled shut. Water erosion is not a hazard.

Included with this soil in mapping are Gladewater and Gowker soils. Gladewater soils are in positions similar to those of the Kaufman soil. Gowker soils are in slightly higher positions. Also included is a soil similar to the Kaufman soil except it is calcareous. The included soils make up about 15 percent of the map unit.

This Kaufman soil is used mainly as rangeland and is well suited to this use. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees. It also includes some sedges. Major trees are water oak, willow oak, cottonwood, elm, and pecan.

This soil is also used as pasture or hayland. The main limitations are wetness and the dense clayey soil. Improved bermudagrass, common bermudagrass, and Dallisgrass are the main forage. Suitable legumes are white clover and vetch. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

This soil is well suited to crops, such as cotton, grain sorghum, corn, soybeans, and small grains (fig. 12). Wetness and the clayey texture are limitations during some times of the year.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding, wetness, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content.

This Kaufman soil is in capability subclass IIw and in the Clayey Bottomland range site.

Kf—Kaufman clay, frequently flooded. This soil is deep, nearly level, and somewhat poorly drained. It is on bottom lands along large streams. This soil is subject to flooding at least once in 2 years. Slopes are 0 to 1 percent. The areas of this soil are long and narrow and range from 10 to 2,800 acres.

Typically, the surface layer is black clay about 8 inches thick. To a depth of 29 inches, the soil is black clay that has dark yellowish brown mottles. To a depth of 58 inches, it is very dark gray clay that has strong brown mottles. The soil to a depth of 80 inches is dark gray clay. The reaction of this soil is neutral.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Water enters the soil rapidly when it is dry and cracked and enters it very slowly when the soil is wet and the cracks have swelled shut. Water erosion is not a hazard, but floodwaters scour channels in places.

Included with this soil in mapping are Gladewater, Gowker, and Nahatche soils. These soils are in positions similar to those of the Kaufman soil. Also included is a soil similar to Kaufman soil except it is calcareous. The included soils make up about 15 percent of the map unit.

This Kaufman soil is used mainly as rangeland and is well suited to this use. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees. It also includes some sedges. The major hardwood trees are water oak, willow oak, cottonwood, elm, and pecan.

This soil is also used as pasture or hayland. The main limitations are wetness and the dense clayey soil. Flooding is a hazard. Improved bermudagrass and Dallisgrass are the main forage. Suitable legumes are white clover and vetch. Nitrogen and phosphorus fertilizers are needed to sustain forage yields.

This soil is not suited to crop production because of flooding.

This soil is not suited to dwellings, roads, streets, and sanitary facilities because of flooding, wetness, and the shrinking and swelling of the soil with changes in moisture content.

This Kaufman soil is in capability subclass Vw and in the Clayey Bottomland range site.

Kg—Kaufman and Gladewater soils, frequently flooded. These soils are deep and undulating. The Kaufman soil is somewhat poorly drained, and the Gladewater soil is poorly drained. These soils are on bottom lands adjacent to major rivers. These areas have been scarified by the river during periods of flooding. These soils are subject to flooding at least once or twice each year. Slopes are 0 to 3 percent. The areas of this soil generally are long and narrow, but some areas are oval. The areas range from 10 to 145 acres. The Kaufman and Gladewater soils occur with no regular pattern.

This undifferentiated group is 40 to 60 percent Kaufman soil, 30 to 50 percent Gladewater soil, and up to 25 percent soils of minor extent.

Typically, the Kaufman soil has a black clay surface layer about 12 inches thick. To a depth of 80 inches, this soil is clay. It is very dark gray to a depth of 30 inches, dark gray to a depth of 55 inches, and gray with yellowish brown mottles below that depth. This soil is moderately alkaline.

Typically, the Gladewater soil has a neutral, very dark gray clay surface layer about 8 inches thick. The soil is slightly acid, dark gray clay to a depth of 24 inches and neutral, gray clay to a depth of 80 inches. Mottles in shades of brown are below a depth of 8 inches.

The Kaufman and Gladewater soils have very slow permeability, and the available water capacity is high. Runoff is slow on the Kaufman soil, and very slow on the Gladewater soil. Very slight increases in the water level of the river can cause flooding. Water erosion is not a hazard, but channels are scoured by floodwaters.

Included with these soils in mapping are areas of Gowker, Hatliff, Nahatche, and Nugent soils. Gowker and Nahatche soils are adjacent to streams in positions similar to those of the Kaufman and Gladewater soils. Hatliff and Nugent soils are in slightly lower areas

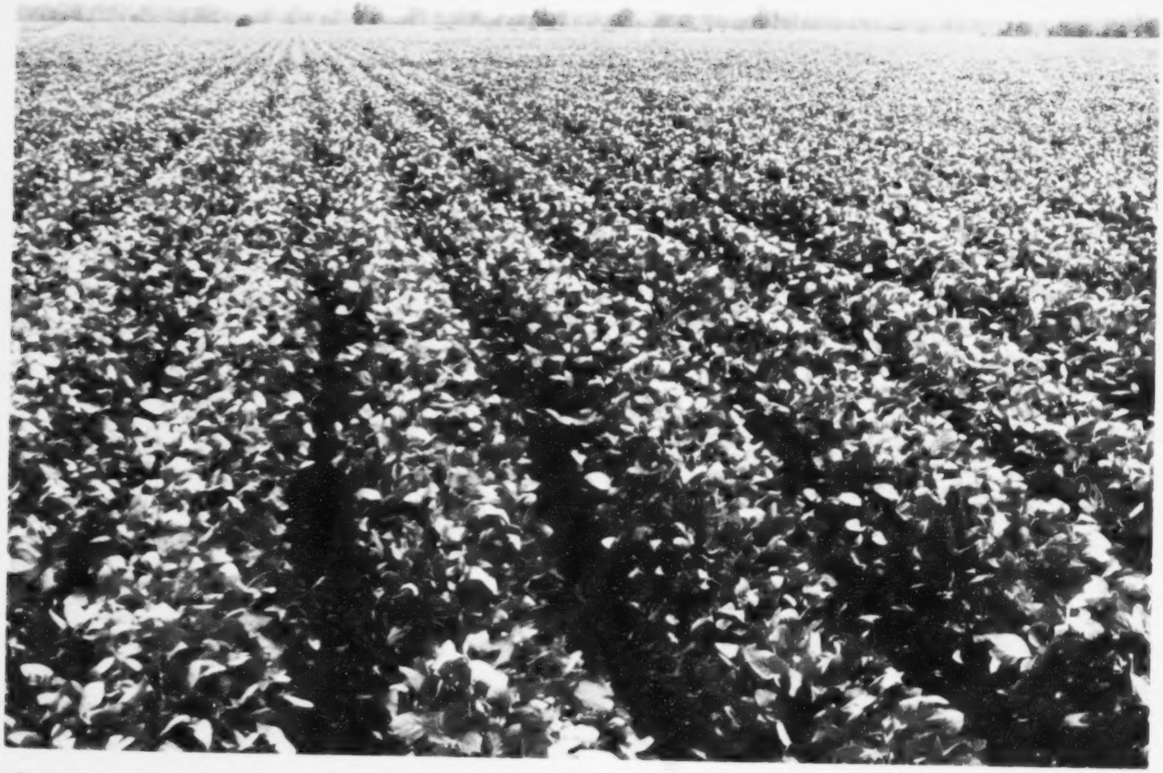

Figure 12.—**Kaufman clay, occasionally flooded, has a high potential for crop production, but crop losses can occur because of flooding.**

adjacent to the river. Also included is a soil similar to the Gladewater soil except it is ponded. Other inclusions are areas of soils that have slopes of 3 to 8 percent and soils that have a clay loam to fine sandy loam surface layer. The included soils make up less than 25 percent of the map unit.

The Kaufman and Gladewater soils are used mainly as woodland and are suited to the production of hardwood trees. Dominant trees are water oak, willow oak, eastern cottonwood, elm, pecan, and American sycamore. In woodland areas, flooding and wetness limit the production of understory plants that can be grazed by livestock and game animals. Dominant understory plants are sedges, Canada wildrye, Virginia wildrye, and switchcane.

In a few areas, these soils are used as pasture or hayland. The main limitations are wetness and the clayey texture. Flooding is a hazard in pasture and hayland areas. Common bermudagrass and Dallisgrass are the main forage. White clover is a suitable legume.

These soils can be used as rangeland. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees. It also includes some sedges.

These soils are not suited to crop production because of the frequent flooding.

These soils are not suited to dwellings, roads, streets, and sanitary facilities because of flooding and wetness. Very slow permeability and shrinking and swelling of the soil are also limitations.

Kaufman and Gladewater soils are in capability subclass Vw and in the Clayey Bottomland range site. The woodland ordination symbol for both soils is 5W.

KrB—Kirvin fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on broad uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 250 acres.

Typically, the surface layer is medium acid, brown fine sandy loam about 5 inches thick. The subsurface layer to a depth of 9 inches is medium acid, pale brown fine sandy loam. The subsoil extends to a depth of 60 inches. It is clay that is strongly acid and red in the upper part and very strongly acid and light gray in the lower part. The substratum to a depth of 80 inches is very strongly acid, light brownish gray clayey shale.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Cuthbert, Oakwood, Tenaha, and Wolfpen soils. Cuthbert and Tenaha soils are on steeper slopes than the Kirvin soil. Oakwood and Wolfpen soils are in positions similar to those of the Kirvin soil, and they have a more yellow subsoil. Wolfpen soils also have a sandy surface layer 20 to 40 inches thick. The included soils make up less than 15 percent of the map unit.

This Kirvin soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as woodland and is moderately suited to the production of pine and hardwood trees. The hazard of erosion is a concern in management. Dominant trees are loblolly pine, shortleaf pine, southern red oak, and sweetgum. The hazard of erosion limits the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, pineywoods dropseed, low panicums, American beautyberry, yaupon, and greenbrier.

This soil is not used for crops, but it could be used for corn and grain sorghum. Water erosion is the most restrictive feature.

This soil is moderately suited to dwellings, streets, roads, and sanitary facilities. The main limitations are shrinking and swelling of the soil and the moderately slow permeability. Low strength is also a limitation for streets and roads.

This Kirvin soil in capability subclass IIIe. The woodland ordination symbol is 8A.

KsB—Kirvin gravelly fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on knobs and ridges on uplands. The areas of this soil are mostly oblong to rounded and range from about 5 to 30 acres.

Typically, the surface layer is slightly acid, gravelly fine sandy loam about 9 inches thick. It is dark grayish brown in the upper part and yellowish brown in the lower part. The subsoil to a depth of 42 inches is very strongly acid, red clay, and to a depth of 52 inches, it is very strongly acid, yellowish red sandy clay loam. The substratum to a depth of 80 inches is very strongly acid, reddish stratified sandstone and sandy clay loam.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Cuthbert soils. These soils are in positions similar to those of the Kirvin soil. Also included are areas of Kirvin fine sandy loam. The included soils make up less than 15 percent of the map unit.

This Kirvin soil is used mainly as woodland; however, it is poorly suited to the production of pine and hardwood trees because of the gravelly surface layer and the clayey subsoil. Dominant trees are loblolly pine, shortleaf pine, southern red oak, and sweetgum. This soil is well suited to the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, slender dropseed, longleaf uniola, low panicum, American beautyberry, dogwood, blackberry, and greenbrier.

This soil is also used as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

The main limitations for dwellings, roads, streets, and sanitary facilities are the shrinking and swelling of the soil and the moderately slow permeability. Low strength is an additional limitation for roads and streets.

This Kirvin soil is in capability subclass IVe. The woodland ordination symbol is 6F.

LaC—Larue loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping and strongly sloping, and well drained. It is on convex ridges and smooth uplands. The areas of this soil are irregular in shape and range from 5 to 220 acres.

Typically, the surface layer is medium acid, brown loamy fine sand about 7 inches thick. The subsurface layer to a depth of 26 inches is slightly acid, very pale brown loamy fine sand. The subsoil to a depth of 44 inches is medium acid, yellowish red sandy clay loam. To a depth of 80 inches, it is strongly acid, red sandy clay loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and around construction sites.

Included with this soil in mapping are areas of Flo, Pickton, Tonkawa, and Wolfpen soils. Flo, Pickton, and Tonkawa soils are in positions similar to and slightly higher than those of Larue soil. Wolfpen soils are in slightly lower positions. Also included is a soil similar to the Larue soil except the surface layer is less than 20 inches thick. The included soils make up less than 15 percent of the map unit.

This Larue soil is used mainly as woodland and is moderately suited to pine trees. Seedling mortality, caused by the droughtiness of the soil, is a concern in management. The dominant trees are loblolly pine and shortleaf pine. Plant competition and rapid increase in the overstory canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are longleaf uniola, pinehill bluestem, pineywoods dropseed, American beautyberry, dogwood, and yaupon.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation for use as pasture or hayland is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

Very little of this soil is used for crops, but it is suited to peanuts, watermelons, and corn. Cover crops, high residue crops, and green manure crops can reduce the hazard of erosion and help maintain fertility. Fertilizer and lime are needed for good yields.

This soil is well suited to dwellings, roads, streets, and sanitary facilities.

This Larue soil is in capability subclass IIIe. The woodland ordination symbol is 8S.

LeB—Lexton clay loam, 1 to 3 percent slopes. This soil is deep, gently sloping, and well drained. It is in broad, plane to slightly convex areas on uplands. The areas of this soil are irregular to oblong in shape and range from 10 to 1,000 acres.

Typically, the surface layer is slightly acid, dark reddish brown clay loam about 7 inches thick. The subsoil to a depth of 17 inches is medium acid, dark reddish brown clay. To a depth of 57 inches, the soil is medium acid, dark red clay. The substratum to a depth of 80 inches is mildly alkaline, reddish brown clay and weathered glauconitic material.

Permeability is moderately slow, and the available water capacity is high. Runoff is medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Benchley, Flynn, Hearne, Jedd, Margie, and Marquez soils. Benchley soils are in concave colluvial positions. Flynn and Margie soils are in positions similar to those of the Lexton soil. Hearne, Jedd, and Marquez soils are in higher positions. The included soils make up 10 to 15 percent of the map unit.

This Lexton soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used for rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil can be used for crops, such as cotton, corn, grain sorghum, soybeans, and small grains. Water erosion is a hazard, but terraces and contour farming can help control erosion.

The main limitations for dwellings, roads, streets, and sanitary facilities are the moderately slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Lexton soil is in capability subclass IIe and in the Deep Redland range site.

LfA—Lufkin fine sandy loam, 0 to 1 percent slopes. This soil is deep, nearly level, and somewhat poorly drained. It is in broad areas on uplands. The areas of this soil are irregular to oblong in shape and range from 5 to 660 acres.

Typically, the surface layer is medium acid, dark grayish brown fine sandy loam about 6 inches thick. The subsoil to a depth of 35 inches is very strongly acid, gray clay. To a depth of 48 inches, it is neutral gray clay, and to a depth of 60 inches, it is slightly acid, light gray clay that has yellowish and brownish mottles. The substratum to a depth of 72 inches is medium acid gray clay that has red mottles.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. Erosion is not a hazard.

Included with this soil in mapping are areas of Axtell, Crockett, Mabank, Rader, Tabor, and Wilson soils. Axtell, Crockett, Rader, and Tabor soils are in slightly higher positions than the Lufkin soil. Mabank and Wilson soils are in positions similar to those of the Lufkin soil. The included soils make up less than 15 percent of the map unit.

This Lufkin soil is used mainly as pasture or hayland. The forage includes improved bermudagrass, bahiagrass, arrowleaf clover, crimson clover, and vetch. The main limitations are the dense clayey subsoil and wetness. Fertilizer is needed for best forage production. Lime may be needed.

This soil is used as rangeland. The climax vegetation is tall grasses in an oak savannah.

This soil is poorly suited to crop production because of wetness and the dense clayey subsoil.

The main limitations for dwellings, roads, streets, and sanitary facilities are wetness, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Lufkin soil is in capability subclass IIIw and in the Claypan Savannah range site.

LmB—Lummus fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on concave side slopes or near the head of drainageways on uplands. The areas of this soil are irregular to oblong in shape and range from 5 to 990 acres.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 8 inches thick. The subsurface layer to a depth of 24 inches is slightly acid, light yellowish brown fine sandy loam. To a depth of 27 inches, the soil is strongly acid, brownish yellow sandy clay loam that has tongues of light yellowish brown fine sandy loam. The subsoil to a depth of 51 inches is very strongly acid, light gray clay that has dark red and brownish yellow mottles. To a depth of 75 inches, it is very strongly acid, light brownish gray clay loam that has red and yellowish red mottles. To a depth of 80 inches, the soil is very strongly acid, light gray sandy clay loam that has yellow and red mottles.

Permeability is slow, and the available water capacity is moderate. Runoff is slow to medium. A perched high water table is above the subsoil for short periods following heavy rains. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Oakwood, Pickton, and Wolfpen soils. These soils are in higher positions on the landscape than the Lummus soil and are better drained. Also included is a soil similar to the Lummus soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Lummus soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. Fertilizer and lime are needed for sustained production.

This soil is also used as woodland and is moderately suited to pine and hardwood trees. The dominant trees are loblolly pine, shortleaf pine, southern red oak, and sweetgum. Wetness can hamper harvesting operations. This soil is well suited to the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, beaked panicum, switchgrass, longleaf uniola, brownseed paspalum, American beautyberry, waxmyrtle, and yaupon.

This soil can be used for crops, such as corn, watermelons, and peanuts; however, erosion is a hazard.

This soil is moderately suited to dwellings, roads, streets, and sanitary facilities. The main limitatons are wetness and the slow permeability. Low strength is an additional limitation for roads and streets.

This Lummus soil is in capability subclass IIe. The woodland ordination symbol is 8Wb.

MaA—Mabank fine sandy loam, 0 to 1 percent slopes. This soil is deep, nearly level, and somewhat poorly drained. It is in broad, smooth areas on uplands. The areas of this soil are irregular to oblong in shape and range from 5 to 100 acres.

Typically, the surface layer is medium acid, grayish brown fine sandy loam about 6 inches thick. The subsoil to a depth of 23 inches is medium acid, black clay. To a depth of 44 inches, it is very dark gray clay that is moderately alkaline in the upper part and slightly acid in the lower part. To a depth of 72 inches, the soil is medium acid, gray clay.

Permeability is very slow, and the available water capacity is moderate. Runoff is very slow. Erosion is not a hazard.

Included with this soil in mapping are areas of Axtell, Benchley, Dimebox, Crockett, Lufkin, and Wilson soils. Axtell, Benchley, Crockett, and Dimebox soils are in slightly higher positions on the landscape than the Mabank soil. Lufkin and Wilson soils are in positions similar to those of the Mabank soil. The included soils make up less than 15 percent of the map unit.

This Mabank soil is used mainly as pasture or hayland. Improved bermudagrass, bahiagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. The main limitations for use as pasture or hayland are wetness and the dense clayey subsoil. Fertilizer is needed for sustained forage yields. Droughtiness reduces forage yields in the summer.

This soil is well suited to use as rangeland. The climax vegetation is a tall grass prairie with a few scattered elm, hackberry, and oak trees.

This soil could be used for crops. The major limitations are the dense clayey subsoil, wetness, and the crusty surface. Crops that can be grown are cotton, corn, grain sorghum, and small grains.

The main limitations for dwellings, roads, streets, and sanitary facilities are wetness, very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Mabank soil is in capability subclass IIIw and in the Claypan Prairie range site.

MgB—Margie fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is in convex areas on uplands. The areas of this soil are irregular in shape and range from 5 to 920 acres.

Typically, the surface layer is slightly acid, dark reddish brown fine sandy loam about 10 inches thick. The subsoil is slightly acid, dark red sandy clay loam to a depth of 14 inches and slightly acid, red clay to a depth of 27 inches. It is slightly acid, dark red very gravelly sandy clay to a depth of 46 inches and is medium acid, red sandy clay loam to a depth of 63 inches. The next layer to a depth of 70 inches is medium acid, red fine sandy loam and yellowish red sandstone. The substratum to a depth of 80 inches is dark red, strongly acid, stratified shale and weakly cemented sandstone and weathered glauconitic material.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Flynn, Hearne, Marquez, and Lexton soils. These soils are in positions similar to those of the Margie soil. Also included is a soil similar to the Margie soil except the surface layer is loam. The included soils make up less than 15 percent of the map unit.

This Margie soil is used as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil is well suited to crops, such as cotton, corn, grain sorghum, and small grains. Erosion is a hazard, but terraces, contour farming, and cover crops help to control this problem.

The main limitations for dwellings, roads, streets, and sanitary facilities are the moderately slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Margie soil is in capability subclass IIIe and in the Deep Redland range site.

MgD—Margie fine sandy loam, 5 to 8 percent slopes. This soil is deep, strongly sloping, and well drained. It is on side slopes on uplands. The areas of this soil are elongated and range from 5 to 270 acres.

Typically, the surface layer is neutral, dark reddish brown fine sandy loam about 11 inches thick. To a depth of 38 inches, the subsoil is slightly acid, dark red clay. To a depth of 60 inches, the soil is slightly acid, yellowish brown clay.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Flynn, Hearne, Marquez, and Lexton soils. These soils are in positions similar to those of the Margie soil. Also included is a soil similar to the Margie soil except the surface layer is loam. The included soils make up less than 15 percent of the map unit.

This Margie soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil is poorly suited to crop production because of the severe hazard of erosion.

The main limitations for dwellings, roads, streets, and sanitary facilities are the moderately slow permeability and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. In some areas steepness of slope is a limitation for urban uses.

This Margie soil is in capability subclass IVe and in the Deep Redland range site.

MhC—Margie-Gullied land complex, 1 to 8 percent slopes. This map unit consists of Margie soil and areas of Gullied land on uplands. This Margie soil is deep and well drained. It is in concave areas that have severe gully erosion (fig. 13). The areas of Margie soil and Gullied land are irregular in shape and range from 5 to 35 acres. The U-shaped gullies are 5 to 30 feet deep and 10 to 100 feet wide. Some areas have gullies that are isolated to one point in a field, and others occur in a successive pattern. The bottom of the gullies is mostly barren of vegetation and is actively eroding. The Margie soil makes up 50 to 70 percent of this map unit.

Typically, the Margie soil has a medium acid, reddish brown fine sandy loam surface layer about 2 inches thick. The next layer to a depth of 34 inches is medium acid, dark red and red clay. The subsoil to a depth of 60 inches is very strongly acid, reddish yellow sandy clay loam. The substratum to a depth of 80 inches is strongly acid, yellowish red sandy clay loam that has white and light gray mottles.

The Margie soil has moderately slow permeability. The available water capacity is moderate. Runoff is medium to rapid. Erosion is a severe hazard.

The soil in this complex is not suited to cultivation because of the gullies. Most areas of this soil have been cultivated in the past, and most of the gullies formed as the soil was cropped.

The Margie soil in this map unit is used as pasture. It is poorly suited to pasture or hayland plants because of the uncrossable gullies, and the quality of the pasture plants is poor.

Reclamation of the gullied areas is difficult because of the limited amount of deep soil needed as a source of backfill. Revegetation, using ground cover plants, is possible. Some areas have been shaped and used as pond sites.

This Margie soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of the hazard of erosion, the moderately slow permeability, and the shrinking and swelling of the subsoil. Low strength is an additional limitation for roads and streets.

This Margie soil is in capability subclass VIe and in the Deep Redland range site. The Gullied land is not assigned to a capability subclass or a range site.

MkB—Marquez very fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on broad ridges and side slopes on uplands. The areas of this soil generally are irregular to oblong in shape and range from 5 to 260 acres.

Typically, the surface layer is strongly acid, dark yellowish brown very fine sandy loam about 7 inches thick. The subsurface layer to a depth of 13 inches is strongly acid, brownish yellow very fine sandy loam. The subsoil to a depth of 42 inches is very strongly acid, yellowish red clay that has red mottles in the lower part. To a depth of 50 inches, the soil is very strongly acid clay that is mottled red, light brownish gray, and yellowish red. The substratum to a depth of 80 inches is very strongly acid, stratified red and light gray silty clay and weakly cemented sandstone.

Permeability is slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Gasil and Hearne soils. Gasil soils are in slightly lower positions on the landscape than the Marquez soil. Hearne soils are on steeper side slopes. The included soils make up less than 15 percent of the map unit.

This Marquez soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season

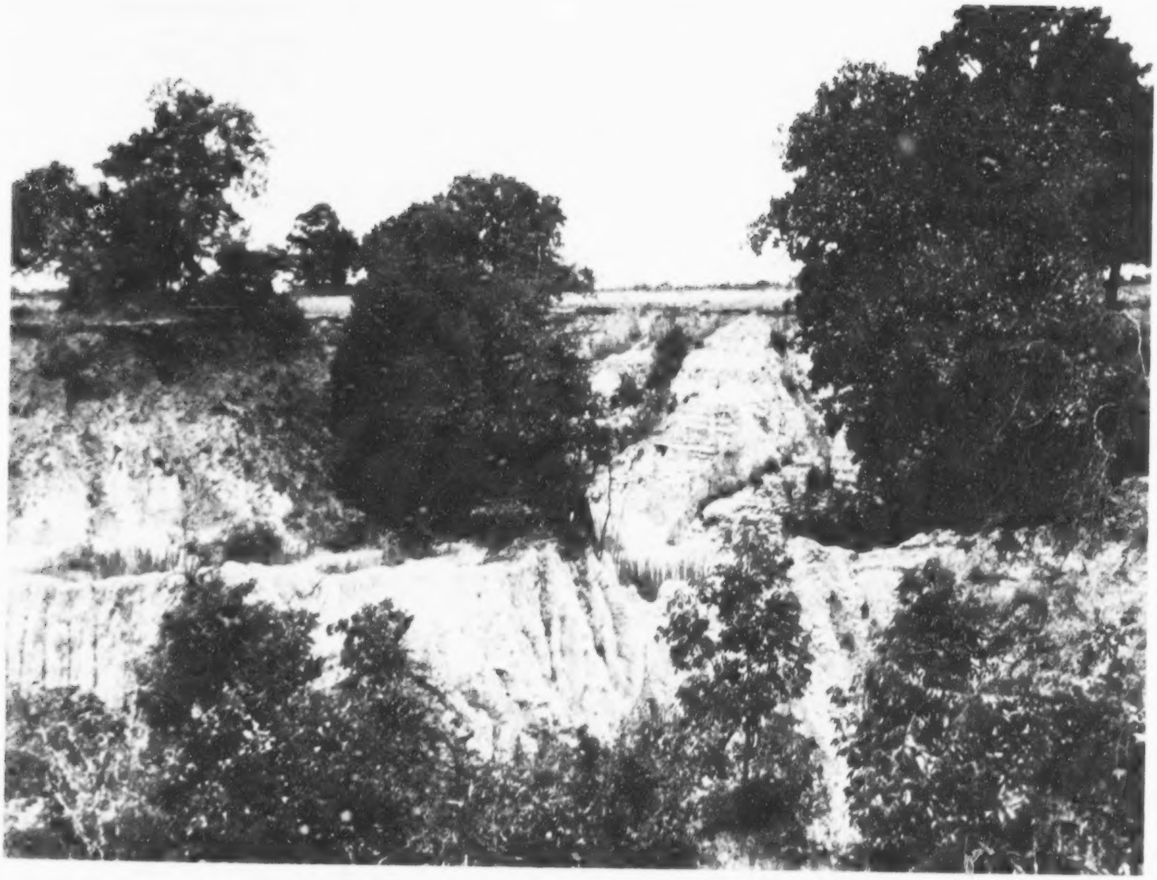

Figure 13.—Large gullies are a problem in areas of the Margie-Gullied land complex, 1 to 8 percent slopes.

and improve the soil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crops because of droughtiness and the severe hazard of erosion, but such crops as cotton, corn, and grain sorghum are suitable. Terraces, contour farming, and cover crops help to control the water erosion. Fertilizer and lime are needed for best production.

The main limitation for dwellings, roads, and streets is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. Slow permeability restricts the use of this soil for sanitary facilities.

This Marquez soil is in capability subclass IIIe and in the Sandy Loam range site.

MrB—Marquez gravelly fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is on small knobs and ridges on uplands. The areas of this soil generally are oval and range from 5 to 642 acres.

Typically, the surface layer is gravelly fine sandy loam about 10 inches thick. It is strongly acid and dark brown in the upper part and medium acid and brown in the lower part. The subsoil to a depth of 48 inches is very strongly acid, red clay. The substratum to a depth of 65 inches is very strongly acid, stratified red and light gray clay, shale, and weakly cemented sandstone.

Permeability is slow, and the available water capacity is moderate. Runoff is medium to rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Gasil and Hearne soils. Gasil soils are in slightly lower positions on the landscape than the Marquez soil. Hearne soils are on steeper side slopes. The included soils make up less than 15 percent of the map unit.

This Marquez soil is used as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crop production because of the gravelly surface layer and the hazard of erosion.

The main limitation for dwellings, roads, and streets is the shrinking and swelling of the soil. Low strength is an additional limitation for roads and streets. Slow permeability restricts the use of this soil for sanitary facilities.

This Marquez soil is in capability subclass IIIe and in the Sandy Loam range site.

Ms—Melhomes loamy fine sand, 0 to 1 percent slopes. This soil is deep, nearly level, and poorly drained. It is in poorly defined drainageways and on lower slopes in drainageways. This soil is saturated throughout most of the year. The areas of this soil are long and narrow and range from 5 to 800 acres.

Typically, the surface layer is black loamy fine sand about 10 inches thick. To a depth of 20 inches, the soil is dark gray loamy fine sand, and to a depth of 70 inches, it is light gray loamy fine sand. This soil is very strongly acid.

Permeability is rapid. Runoff is very slow. This soil is ponded, or a high water table is within 12 inches of the surface throughout the year. Water erosion is a slight hazard.

Included with this soil in mapping are areas of Arenosa, Hatliff, Nahatche, Nugent, Padina, Pickton, and Tonkawa soils. Arenosa, Padina, Pickton, and Tonkawa soils are well drained and are in higher positions adjacent to the Melhomes soil. Hatliff, Nahatche, and Nugent soils are in positions similar to those of the Melhomes soil, but they are better drained. Small areas of peat are also included. The included soils make up less than 15 percent of the map unit.

This Melhomes soil is used as rangeland. It is poorly suited to use as rangeland, but this is its best use. The main limitation is the constant wetness. The major range plants are maidencane, waxmyrtle, pitcherplant, sedges, and other aquatic type vegetation.

This soil is not suited to crops or pasture because of severe wetness.

This soil is not suited to dwellings, roads, streets, or sanitary facilities because of wetness. Peat has been mined on a small scale from some areas of this soil.

This Melhomes soil is in capability subclass VIIw and in the Flatwoods range site.

Na—Nahatche loam, frequently flooded. This soil is deep, nearly level, and somewhat poorly drained. It is on bottom lands along flood plains of major creeks. Slopes are 0 to 1 percent. The areas of this soil are mostly long and narrow and range from 5 to 1,900 acres.

Typically, the surface layer is neutral, very dark grayish brown loam about 3 inches thick. The underlying material to a depth of 25 inches is slightly acid, dark grayish brown loam that has grayish and brownish mottles. The next layer to a depth of 43 inches is neutral, dark gray clay loam that has brownish mottles. To a depth of 48 inches, the soil is slightly acid, very dark gray clay loam, and to a depth of 72 inches, it is slightly acid, dark gray clay loam that has brownish and reddish mottles.

Permeability is moderate, and the available water capacity is high. Runoff is slow. This soil is subject to flooding at least once every 2 years. The high water table is at or near the surface in winter and spring. Water erosion is not a hazard, but floodwaters scour channels in places.

Included with this soil in mapping are Gladewater, Hatliff, and Nugent soils. Gladewater and Hatliff soils are in positions similar to those of the Nahatche soil. Nugent soils are in slightly higher positions. The included soils make up less than 15 percent of the map unit.

This soil is used mainly as pasture. It is moderately suited to pasture and hayland plants. The main limitation is wetness, and flooding is a hazard. Common bermudagrass, bahiagrass, and Dallisgrass are the main forage. White clover, vetch, and arrowleaf clover are suitable legumes. Fertilizer and lime are needed for sustained production.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses under a 30 percent canopy of hardwood trees. It also includes some shrubs, vines, and sedges.

This Nahatche soil is well suited to use as woodland. Wooded areas consist of hardwoods, such as American sycamore, water oak, willow oak, eastern cottonwood, sweetgum, and pecan. Loblolly pine also grows well on this soil. Flooding is a concern in management. This soil is well suited to the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, broomsedge bluestem, beaked panicum, brownseed paspalum, longleaf uniola, waxmyrtle, and greenbrier.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding and wetness.

This Nahatche soil is in capability subclass Vw and in the Loamy Bottomland range site. The woodland ordination symbol is 11W.

Nu—Nugent loamy fine sand, occasionally flooded. This soil is deep, nearly level, and excessively drained. It is in bottom land areas on flood plains of major creeks. This soil is subject to flooding once every 2 to 5 years. Slopes generally are less than 1 percent but range up to 2 percent. The areas of this soil are mostly 2 to 5 feet higher than surrounding bottom land soils. The areas are elongated to oblong and range from 5 to 140 acres.

Typically, the surface layer is very strongly acid, dark brown loamy fine sand about 16 inches thick. The underlying material to a depth of 33 inches is very strongly acid, brownish yellow loamy fine sand. The next layer to a depth of 60 inches is strongly acid, mottled yellowish brown and strong brown loamy fine sand that has light gray mottles. To a depth of 80 inches, the soil is very strongly acid, mottled brownish yellow, strong brown, very pale brown, and light brownish gray loamy fine sand.

Permeability is moderately rapid, and the available water capacity is low. Runoff is slow. A high water table is at a depth of 3.5 to 6.0 feet during periods of heavy rainfall in the winter and spring. Water erosion is not a hazard.

Included with this soil in mapping are areas of Gowker, Hatliff, and Nahatche soils. These soils are in positions similar to but slightly lower than those of the Nugent soil. The included soils make up less than 15 percent of the map unit.

This Nugent soil is used mainly as pasture. It is only moderately suited to use as pasture or hayland because of droughtiness and the low available water capacity. Improved bermudagrass and common bermudagrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. Fertilizer and lime are needed for best production.

This soil is poorly suited to use as rangeland. The main limitations are droughtiness and the low available water capacity. The climax vegetation is a tall grass savannah with hardwood trees shading 30 percent of the ground. Major trees are sweetgum, cottonwood, water oak, and willow oak.

This Nugent soil is not managed for tree production, but it is suited to this use.

This soil is poorly suited to crops because of droughtiness, low available water capacity, sandy surface layer, and the hazard of flooding.

This soil is poorly suited to dwellings, roads, streets, and sanitary facilities because of flooding.

This Nugent soil is in capability subclass IIIs and in the Loamy Bottomland range site.

OkB—Oakwood fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is in broad, convex areas and on middle to upper side slopes of ridges on uplands. The areas of this soil are oblong to irregular in shape and range from 5 to 680 acres.

Typically, the surface layer is light yellowish brown fine sandy loam about 5 inches thick. The subsurface layer to a depth of 19 inches is slightly acid, very pale brown fine sandy loam. The subsoil to a depth of 27 inches is medium acid, brownish yellow sandy clay loam that has strong brown mottles. To a depth of 39 inches, it is strongly acid, brownish yellow sandy clay loam that has red and yellowish brown mottles. The subsoil to a depth of 80 inches is strongly acid, brownish yellow sandy clay loam that has light gray and red mottles. It contains about 15 percent plinthite.

Permeability is moderately slow, and the available water capacity is high. Runoff is slow to medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Kirvin, Larue, Lummus, Trawick, and Wolfpen soils. Kirvin, Larue, and Trawick soils are in slightly higher positions on the landscape than the Oakwood soil. Lummus soils are in lower concave areas and at the head of drainageways. Wolfpen soils are in positions similar to those of the Oakwood soil. Also included is a soil similar to the Oakwood soil except the surface layer is loamy fine sand. The included soils make up 10 to 15 percent of the map unit.

This Oakwood soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as woodland and is well suited to pine and hardwood trees. The dominant trees are loblolly pine, shortleaf pine, southern red oak, post oak, and hickory. Plant competition and the rapid increase in the tree canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, longleaf uniola, pineywoods dropseed, brownseed paspalum, beaked panicum, low panicums, and yaupon.

This soil is used for crops only in a few areas. It is well suited to such crops as corn, cotton, grain sorghum, and soybeans. Terraces, contour farming, and cover crops help control erosion.

This soil is well suited to dwellings, streets, roads, and sanitary facilities. Low strength is a limitation for roads and streets.

This Oakwood soil is in capability subclass IIIe. The woodland ordination symbol is 9A.

PaC—Padina loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and moderately well drained. It is in broad, smooth to convex areas on uplands. The areas of this soil generally are irregular in shape and range from 10 to 2,100 acres.

Typically, the surface layer is medium acid, pale brown loamy fine sand about 5 inches thick. The subsurface layer to a depth of 58 inches is medium acid, very pale brown loamy fine sand. The subsoil to a depth of 80 inches is strongly acid sandy clay loam that is yellowish brown with grayish and reddish mottles in the upper part and is mottled in shades of gray, red, and yellow in the lower part.

Permeability is moderately slow, and the available water capacity is low. Runoff is slow. A perched high water table is present for short periods following heavy rainfall. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Arenosa, Dutek, Hearne, Jedd, Robco, and Silstid soils. Arenosa, Dutek, and Silstid soils are in positions similar to those of the Padina soil. Hearne and Jedd soils are on steeper side slopes and on small knolls and narrow ridgetops. Robco soils are in lower concave areas and at the head of drainageways. Also included are a soil similar to the Padina soil except the surface layer is fine sand and a soil that has lamellae in the lower part of the profile. The included soils make up less than 15 percent of the map unit.

This Padina soil is used mainly as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitations for rangeland use are droughtiness and the low available water capacity.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations for use as pasture or hayland are droughtiness and the low available water capacity. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil generally is not used for crops because of droughtiness and the low available water capacity. The hazard of erosion and steepness of slope are also limitations. This soil is suited to peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops reduce erosion and help maintain fertility.

This soil is well suited to roads, streets, and buildings. The thick, sandy layers are a poor filter for sewage effluent.

The Padina soil is in capability subclass IIIe and in the Deep Sand range site.

PaD—Padina loamy fine sand, 8 to 15 percent slopes. This soil is deep, strongly sloping to moderately steep, and moderately well drained. It is on narrow side slopes and ridgetops on uplands. The areas of this soil generally are elongated and range from 5 to 430 acres.

Typically, the surface layer is medium acid, pale brown loamy fine sand about 7 inches thick. The subsurface layer to a depth of about 42 inches is very pale brown loamy fine sand. The subsoil to a depth of 80 inches is strongly acid, brownish yellow sandy clay loam that has red and gray mottles.

Permeability is moderately slow, and the available water capacity is low. Runoff is slow to rapid. Water erosion is a severe hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of

Arenosa, Hearne, and Jedd soils. Arenosa soils are in slightly higher positions on the landscape than the Padina soil. Hearne and Jedd soils are in positions similar to those of the Padina soil. Also included is a soil similar to the Padina soil except the surface layer is fine sand. The included soils make up less than 15 percent of the map unit.

This Padina soil is used mainly as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitations for rangeland use are droughtiness and the low available water capacity.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations for pasture or hayland are droughtiness, the low available water capacity, the hazard of erosion, and steepness of slope. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is not suited to crop production because of the severe hazard of erosion and steepness of slope.

Steepness of slope is a limitation for roads, streets, and buildings. The thick, sandy layers are a poor filter for sewage effluent, and downslope seepage is a problem in places.

This Padina soil is in capability subclass VIe and in the Deep Sand range site.

PkC—Pickton loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping to strongly sloping, and well drained. It is on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 10 to 1,340 acres.

Typically, the surface layer is slightly acid, dark grayish brown loamy fine sand about 4 inches thick. The subsurface layer to a depth of 66 inches is medium acid, loamy fine sand. It is light yellowish brown in the upper part and very pale brown in the lower part. The subsoil to a depth of 75 inches is strongly acid, yellowish brown sandy clay loam that has reddish yellow and yellowish red mottles. To a depth of 84 inches, it is very strongly acid, yellowish red sandy clay loam that has red and light brownish gray mottles.

Permeability is moderate, and the available water capacity is low. Runoff is slow. Water erosion is a slight hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Flo, Larue, Tonkawa, and Wolfpen soils. Flo and Tonkawa soils are on lower side slopes than the Pickton soil. Wolfpen soils are in positions similar to those of the Pickton soil except they have a loamy fine sand surface layer 20 to 40 inches thick. Also included are soils similar to the Pickton soil except the surface layer is fine sand and also some soils that do not have gray mottles in the subsoil. The included soils make up less than 15 percent of the map unit.

This Pickton soil is used mainly as woodland. It is moderately suited to the production of pine and hardwood trees. Dominant trees are loblolly pine and shortleaf pine. The main limiting factors are the low available water capacity and droughtiness. Droughtiness, plant competition, and a rapid increase in the tree canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, pineywoods dropseed, longleaf uniola, American beautyberry, dogwood, yaupon, and greenbrier.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are the low available water capacity and droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil generally is not used for crops because of droughtiness and the low available water capacity, but it is well suited to peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops help maintain fertility.

This soil is well suited to roads, streets, and dwellings. The thick, sandy layers are a poor filter for sewage effluent.

This Pickton soil is in capability subclass IIIs. The woodland ordination symbol is 8S.

PkD—Pickton loamy fine sand, 8 to 15 percent slopes. This soil is deep, strongly sloping to moderately steep, and well drained. It is on narrow side slopes on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 480 acres.

Typically, the surface layer is medium acid, brown loamy fine sand about 6 inches thick. The subsurface layer to a depth of 48 inches is medium acid, light yellowish brown loamy fine sand. The subsoil to a depth of 60 inches is medium acid, brownish yellow sandy clay loam that has strong brown mottles. To a depth of 65 inches, the soil is strongly acid, strong brown sandy clay loam that has light brownish gray and red mottles.

Permeability is moderate, and the available water capacity is low. Runoff is slow to rapid. Water erosion is a severe hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Flo, Tonkawa, and Wolfpen soils. Flo soils are in positions similar to those of the Pickton soil. Tonkawa soils are on concave side slopes and lower side slopes. Also included are soils similar to the Pickton soil except they have a fine sand surface layer, some soils that have slopes of more than 15 percent, and some soils that do not have gray mottles in the subsoil. The included soils make up less than 20 percent of the map unit.

This soil is used mainly as woodland. It is moderately suited to the production of pine and hardwood trees. The main limitations for woodland use are the low available water capacity and droughtiness. Dominant trees are loblolly pine and shortleaf pine. Droughtiness, plant competition, and a rapid increase in the tree canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants on this soil are pinehill bluestem, pineywoods dropseed, longleaf uniola, American beautyberry, dogwood, yaupon, and greenbrier.

This soil is also used as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are the low available water capacity, hazard of water erosion, steepness of slope, and droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil generally is not used for crops because of the severe hazard of erosion and steepness of slope.

Steepness of slope is a limitation for roads, streets, and buildings. The thick, sandy layers are a poor filter for sewage effluent, and downslope seepage is a problem in places.

This Pickton soil is in capability subclass IVe. The woodland ordination symbol is 8S.

RaB—Rader fine sandy loam, 1 to 3 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on broad, slightly mounded terraces and in lower concave areas and at the head of drainageways on uplands. The areas of this soil are oblong to elongated and range from 5 to 1,100 acres.

Typically, the surface layer is slightly acid, dark brown fine sandy loam about 6 inches thick. The subsurface layer to a depth of 24 inches is slightly acid fine sandy loam. It is brown in the upper part and very pale brown in the lower part. To a depth of 30 inches, the soil is strongly acid, yellowish brown sandy clay loam that has streaks and pockets of light gray fine sandy loam. The subsoil to a depth of 54 inches is very strongly acid clay. It is light brownish gray in the upper part and light gray in the lower part. To a depth of 68 inches, it is neutral, light gray clay that has red mottles. To a depth of 80 inches, the soil is moderately alkaline, mottled light gray, light yellowish brown, and dark red sandy clay loam.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow. A perched high water table is at a depth of 2 to 5 feet during periods of prolonged rainfall. Water erosion is a slight hazard.

Included with this soil in mapping are areas of Axtell, Derly, Lufkin, Robco, and Tabor soils. Axtell and Tabor soils are in slightly higher positions on the landscape than the Rader soil. Derly and Lufkin soils are in slightly lower positions. Robco soils are in positions similar to those of the Rader soil. The included soils make up less than 15 percent of the map unit.

This Rader soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This Rader soil generally is not used for crops, but it is suited to most crops, such as corn, cotton, grain sorghum, soybeans, and small grains.

The main limitations for dwellings, streets, and roads are wetness and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. Wetness and very slow permeability restrict the use of this soil for sanitary facilities.

This Rader soil is in capability subclass IIIs and in the Sandy Loam range site.

Rd—Rader-Derly complex, gently undulating. These soils are deep. They are in broad, distinctly mounded areas on old terraces. The Rader soil is on the mounds, and the Derly soil is in the low, intermound areas. The mounds are round to oblong, 10 to 30 inches high, and 40 to 150 feet across. The Rader soil is moderately well drained, and the Derly soil is poorly drained. Slopes range from 1 to 3 percent. The areas of this soil are irregular in shape and range from 5 to 500 acres.

This complex is 65 percent Rader soil, 25 percent Derly soil, and 10 percent other soils.

Typically, the Rader soil has a slightly acid, yellowish brown fine sandy loam surface layer about 8 inches thick. The subsurface layer to a depth of about 19 inches is medium acid, light yellowish brown fine sandy loam. The subsoil to a depth of about 29 inches is strongly acid, brownish yellow loam that has tongues and interfingerings of pale brown fine sandy loam. To a depth of 42 inches it is strongly acid, yellowish brown clay loam, and to a depth of 74 inches it is strongly acid, mottled light brownish gray, yellowish brown, and grayish brown clay grading to sandy clay loam with depth.

Typically, the Derly soil has a medium acid silt loam surface layer about 9 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The subsoil to a depth of 26 inches is strongly acid, light brownish gray silty clay that has tongues and interfingerings of light brownish gray silt loam. Yellowish brown mottles are in the silty clay. To a depth of 66 inches, the subsoil is slightly acid, grayish brown clay that has pockets and streaks of light gray fine sandy loam. The substratum to a depth of 84 inches is neutral clay loam mottled in shades of gray, yellow, and red.

Rader and Derly soils have very slow permeability, and runoff is slow. Derly soil is sometimes ponded for short periods, and it has a perched high water table during periods of heavy rains. The available water capacity is moderate for the Rader soil and high for the Derly soil. Water erosion is a slight hazard in areas of these soils.

Included with this complex in mapping are Attoyac soils. These soils are in slightly higher, better drained areas than the Rader and Derly soils.

The Rader and Derly soils are used mainly as pasture or hayland. Wetness is the main limitation on the Derly soil. Common bermudagrass, improved bermudagrass, bahiagrass, Dallisgrass, switchgrass, tall fescue, singletary peas, and white clover are the main forage. Fertilizer and lime are needed for best production.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main trees on the Rader soil are post oak, blackjack oak, southern red oak, and hickory. Trees on the Derly soil are mainly water oak, southern red oak, sweetgum, and hickory.

In a few areas, these soils are managed as woodland. In addition to the trees in native rangeland areas, loblolly and shortleaf pines are suitable. The main limitation for woodland use is the dense clayey subsoil of both soils and the wetness of the Derly soil. The dense clayey subsoil limits the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, beaked panicum, low panicums, Virginia wildrye, sedges, waxmyrtle, and greenbrier.

The soils in this complex are poorly suited to use as cropland because of wetness. Drainage is needed in areas of the Derly soil. Fertilizer and lime are needed for sustained yields.

The limitations for dwellings, roads, streets, and sanitary facilities are wetness, very slow permeability, and shrinking and swelling of the soil. Low strength is an additional limitation for roads and streets.

The Rader and Derly soils are in capability subclass IIIs. The Rader soil is in the Sandy Loam range site, and the Derly soil is in the Claypan Savannah range site. The woodland ordination symbol is 8Wb for the Rader soil and 4W for the Derly soil.

RoC—Robco loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping and strongly sloping, and moderately well drained. It is on concave side slopes or near the head of drainageways on uplands. The areas of this soil generally are irregular in shape and range from 5 to 250 acres.

Typically, the surface layer is strongly acid, dark brown loamy fine sand about 7 inches thick. The subsurface layer to a depth of 22 inches is medium acid loamy fine sand. It is brown in the upper part and pale brown in the lower part. To a depth of 25 inches, the soil is strongly acid, yellowish brown sandy clay loam that has streaks and pockets of light brownish gray loamy fine sand. The subsoil to a depth of 55 inches is grayish brown clay that has yellowish brown and red mottles. It is very strongly acid in the upper part and strongly acid in the lower part. To a depth of 80 inches, the soil is light brownish gray sandy clay loam that has yellowish brown mottles. It is medium acid in the upper part and neutral in the lower part.

Permeability is slow, and the available water capacity is moderate. Runoff is slow to medium. A perched high water table is above the subsoil during periods of prolonged rainfall. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Padina, Rader, Silstid, and Tabor soils. Padina and Silstid soils are in higher positions on the landscape than the Robco soil and are better drained. Rader and Tabor soils are in positions similar to those of the Robco soil. Also included is a soil similar to the Robco soil except the subsoil has less clay. The included soils make up less than 15 percent of the map unit.

This Robco soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, arrowleaf clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitation for rangeland use is droughtiness.

This soil generally is not used for crops because of droughtiness and the hazard of erosion. This soil, however, is suited to peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops help control erosion and maintain fertility.

The main limitations for sanitary facilities, dwellings, roads, and streets are wetness, slow permeability, and the high shrink-swell potential of the subsoil. Low strength is an additional limitation for roads and streets.

This Robco soil is in capability subclass IIIe and in the Sandy range site.

RxC—Robco-Gullied land complex, 1 to 8 percent slopes. This complex consists of the Robco soil and Gullied land in concave areas on uplands. The Robco soil is moderately well drained. The areas of this soil and Gullied land are irregular in shape and range from 5 to 25 acres. The U-shaped gullies are 3 to 20 feet deep, 10 to 100 feet wide, and 10 to 150 feet apart. The bottom of the gullies is mostly barren of vegetation and is actively eroding. The areas between the gullies are Robco soil, which makes up 25 to 75 percent of the complex.

Typically, the Robco soil has a slightly acid loamy fine sand surface layer about 26 inches thick that is brown in the upper part and light yellowish brown in the lower part. The subsoil to a depth of 70 inches is strongly acid, light gray clay that has mottles in shades of red and yellow. The substratum to a depth of 85 inches is neutral, light gray sandy clay.

The Robco soil is slowly permeable, and the available water capacity is moderate. Runoff is medium. Water erosion is a severe hazard. Soil blowing is a hazard in bare areas and on construction sites.

The soil in this complex is not suited to cultivation because of the gullies. Most areas have been cultivated in the past, and most gullies formed as the soil was cropped.

The Robco soil in this complex is used as pasture. It is poorly suited to pasture plants because of the uncrossable gullies, and the quality of the pasture plants is poor.

Reclamation of the gullied areas is difficult because of the limited amount of deep soil to use as a source of backfill. Revegetation, using ground cover plants, is possible. Some areas have been shaped and used as pond sites.

The Robco soil is poorly suited to sanitary facilities, dwellings, roads, and streets because of wetness, slow permeability, the high shrink-swell potential of the subsoil, and the severe hazard of erosion. Low strength is an additional limitation for roads and streets.

This Robco soil is in capability subclass VIe and in the Sandy range site. The Gullied land is not assigned to a capability subclass or a range site.

SaB—Silawa fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is in convex areas on terraces and uplands. The areas of this soil generally are irregular in shape and range from 5 to 160 acres.

Typically, the surface layer is medium acid, dark brown fine sandy loam about 7 inches thick. The subsurface layer to a depth of 16 inches is medium acid, yellowish brown fine sandy loam. The subsoil to a depth of 40 inches is strongly acid, red sandy clay loam and to a depth of 55 inches is very strongly acid, yellowish red sandy clay loam. To a depth of 70 inches, the soil is very strongly acid, yellowish red fine sandy loam. The substratum to a depth of 84 inches is very strongly acid, strong brown loamy fine sand.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow to medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Dutek, Gasil, and Silstid soils. Dutek and Gasil soils are in positions similar to those of the Silawa soil. Silstid soils are in slightly lower positions on the landscape. Also included is a soil similar to the Silawa soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Silawa soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

In a few areas, this soil is used for crops. It is well suited to such crops as cotton, corn, grain sorghum, and small grains. Erosion is a hazard, but terraces and contour farming can reduce this problem. Cover crops, high residue crops, and green manure crops also help control erosion and maintain fertility. Fertilizer is needed for good yields.

This soil is well suited to sanitary facilities, dwellings, roads, and streets.

This Silawa soil is in capability subclass IIIe and in the Sandy Loam range site.

SaD—Silawa fine sandy loam, 5 to 8 percent slopes. This soil is deep, strongly sloping, and well drained. It is on narrow side slopes on terraces and uplands. The areas of this soil are long and narrow and range from 5 to 170 acres.

Typically, the surface layer is slightly acid, brownish fine sandy loam about 8 inches thick. The subsoil to a depth of 46 inches is medium acid, reddish sandy clay loam. To a depth of 80 inches, the soil is medium acid, brownish fine sandy loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is medium. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Dutek and Gasil soils. Dutek soils are in slightly lower positions on the landscape than the Silawa soil. Gasil soils are in slightly higher positions. Also included is a soil similar to the Silawa soil except the surface layer is loamy fine sand. The included soils make up less than 15 percent of the map unit.

This Silawa soil is used mainly as pasture or hayland. It is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production. Lime may also be needed.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crops because of the severe hazard of erosion.

This soil is well suited to sanitary facilities, dwellings, roads, and streets.

The Silawa soil is in capability subclass IVe and in the Sandy Loam range site.

SdB—Silstid loamy fine sand, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is in broad areas on uplands. The areas of this soil generally are irregular in shape and range from 5 to 900 acres.

Typically, the surface layer is slightly acid, brown loamy fine sand about 6 inches thick. The subsurface layer to a depth of 24 inches is slightly acid, light yellowish brown loamy fine sand. The subsoil to a depth of 64 inches is medium acid sandy clay loam. It is yellowish brown in the upper part and brownish yellow in the lower part. To a depth of 80 inches, it is medium acid, yellow fine sandy loam.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Dutek, Gasil, Padina, and Robco soils. Dutek and Padina soils are in slightly higher positions on the landscape than the Silstid soil. Gasil soils are in positions similar to those of the Silstid soil. Robco soils are on lower side slopes and in concave positions. Some Silstid soils that have slopes of more than 5 percent are also included. The included soils make up less than 15 percent of the map unit.

This soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation for use as pasture or hayland is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This soil is also used as rangeland. The climax vegetation is tall grasses in an oak savannah. The main limitation for rangeland use is droughtiness.

This soil generally is not used for crops because of droughtiness and the hazard of erosion. This soil, however, is suited to peanuts, watermelons, peas, and sweet potatoes. Fertilizer and lime are essential for good yields. Cover crops, high residue crops, and green manure crops help control erosion and maintain fertility.

This soil is well suited to most urban uses.

This Silstid soil is in capability subclass IIIe and in the Sandy range site.

TaB—Tabor fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on broad, smooth uplands. The areas of this soil generally are irregular in shape and range from 5 to 115 acres.

Typically, the surface layer is medium acid, brown fine sandy loam about 8 inches thick. The subsurface layer to a depth of 16 inches is medium acid, light yellowish brown fine sandy loam. The subsoil to a depth of 37 inches is strongly acid, yellowish brown clay that has reddish and grayish mottles. To a depth of 63 inches, the soil is strongly acid, mottled gray, yellow, and red clay. The substratum to a depth of 80 inches is strongly acid, stratified clay, shale, and weakly cemented sandstone.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow to medium. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Axtell, Crockett, Lufkin, and Rader soils. Axtell and Crockett soils are in positions similar to those of the Tabor soil. Lufkin and Rader soils are in slightly lower positions. The included soils make up less than 15 percent of the map unit.

This Tabor soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass prolong the grazing season and improve the soil. A complete fertilizer is needed for sustained production.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is tall grasses in an oak savannah.

This soil generally is not used for crops because of the severe hazard of erosion, steepness of slope, and the dense clayey subsoil.

The main limitation for dwellings, roads, and streets is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. The very slow permeability restricts the use of this soil for sanitary facilities.

This Tabor soil is in capability subclass IVe and in the Sandy Loam range site.

TcE—Tenaha-Cuthbert complex, 8 to 20 percent slopes. This complex consists of soils that are deep, strongly sloping to moderately steep, and well drained. These soils are on broad hills and side slopes above drainageways on uplands. The Tenaha soil is mostly in the mid slope and lower slope positions, and the Cuthbert soil is mostly on the upper side slopes and crests. Slopes range from 5 to 20 percent. The areas of this soil are mainly long and narrow and range from 10 to 1,940 acres.

The complex is 45 percent Tenaha soil, 35 percent Cuthbert soil, and about 20 percent other soils.

Typically, the Tenaha soil has a medium acid, dark brown loamy fine sand surface layer about 5 inches thick. The subsurface layer to a depth of 36 inches is medium acid, brown loamy fine sand. The subsoil to a depth of 57 inches is strongly acid sandy clay loam. It is yellowish red in the upper part and strong brown in the lower part. The substratum to a depth of 72 inches is very strongly acid, reddish yellow sandy loam textured sandstone.

Typically, the Cuthbert soil has a medium acid fine sandy loam surface layer about 9 inches thick. It is dark brown in the upper part and brown in the lower part. The subsoil to a depth of 32 inches is very strongly acid, red clay. The substratum to a depth of 60 inches is very strongly acid, stratified, red and yellow shale and weakly cemented sandstone.

The Tenaha soil has slow runoff and is moderately permeable. The Cuthbert soil has medium to rapid runoff and is moderately slowly permeable. The available water capacity is moderate for these soils. Water erosion is a severe hazard.

Included with this complex in mapping are Pickton and Wolfpen soils. These soils are on toe slopes and tops of the crests.

The Tenaha and Cuthbert soils in this complex are used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are steepness of slope, the hazard of erosion, and droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

These soils are also used as woodland. They are moderately suited to pine and hardwood trees. Shortleaf pine, loblolly pine, southern red oak, and post oak are dominant. The sandy surface layer of the Tenaha soil and the clayey subsoil of the Cuthbert soil are the main limitations for woodland use. Droughtiness, steepness of slope, and the hazard of erosion are also concerns in management. Steepness of slope, hazard of erosion, droughtiness, plant competition, and a rapid increase in the tree canopy limit the production of understory plants. Major understory plants are longleaf uniola, pinehill bluestem, splitbeard bluestem, pineywoods dropseed, yaupon, and greenbrier.

These soils are not suited to use as cropland because of steepness of slope and the severe hazard of erosion.

Steepness of slope is a limitation for buildings, roads, streets, and sanitary facilities. Shrinking and swelling of the soil and the moderately slow permeability restrict the use of the Cuthbert soil. Low strength is an additional limitation for roads and streets.

The Tenaha and Cuthbert soils are in capability subclass VIe. The woodland ordination symbol is 8S for the Tenaha soil and 8C for the Cuthbert soil.

ToC—Tonkawa fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping and strongly sloping, and excessively drained. It is on broad uplands. The areas of this soil generally are irregular in shape and range from 5 to 340 acres.

Typically, the surface layer is slightly acid, dark brown fine sand about 18 inches thick. The underlying material to a depth of 58 inches is slightly acid, yellowish brown fine sand, and to a depth of 84 inches, it is slightly acid, white fine sand.

Permeability is rapid, and the available water capacity is low. Runoff is very slow. Water erosion is not a hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Flo, Pickton, and Wolfpen soils. Flo, Pickton, and Wolfpen soils are in positions similar to those of the Tonkawa soil. Also included are soils that are similar to the Tonkawa soil except they have thin bands of sandy loam in the lower part of the profile. The included soils make up less than 15 percent of the map unit.

This Tonkawa soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitations are droughtiness, low available water capacity, and the loose sandy surface. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

In some areas, this soil is used as woodland, but it is poorly suited to the production of pine and hardwood trees. The dominant trees are shortleaf pine and loblolly pine intermingled with blackjack oak and post oak. The main limitations for woodland use are the low available water capacity and droughtiness. This soil is poorly suited to the production of understory plants that can be grazed by livestock and game animals. The low available water capacity and droughtiness reduce the production of forage plants. Major understory plants are pinehill bluestem, splitbeard bluestem, slender indiangrass, purple lovegrass, threeawn, bluejack oak, sassafras, and muscadine grape.

This soil generally is not used for crops because of droughtiness, the low available water capacity, loose sandy surface, and steepness of slope.

This soil is well suited to roads, streets, and buildings. The rapidly permeable sand is a poor filter for sewage effluent.

This Tonkawa soil is in capability subclass IVs. The woodland ordination symbol is 5S.

TrB—Trawick fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and well drained. It is in broad, convex areas on uplands. The areas of this soil generally are irregular in shape and range from 5 to 700 acres.

Typically, the surface layer is slightly acid, dark red fine sandy loam about 6 inches thick. The subsoil to a depth of 35 inches is medium acid, red clay. The next layer to a depth of 43 inches is medium acid, dark red clay interbedded with weathered glauconitic material. The substratum to a depth of 60 inches is strongly acid, weathered glauconitic material and glauconitic greensand.

Permeability is moderately slow, and the available water capacity is moderate. Runoff is medium. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Elrose, Kirvin, and Oakwood soils. Elrose soils are on lower foot slopes. Kirvin soils are in positions similar to those of the Trawick soil. Oakwood soils are in slightly higher positions. Also included is a soil similar to the Trawick soil except the surface layer is clay loam or gravelly fine sandy loam. Soils that have a yellowish subsoil are in slightly concave positions. The included soils make up less than 15 percent of the map unit.

This Trawick soil is used mainly as pasture or hayland and is well suited to these uses. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. Fertilizer and lime are needed for sustained production.

This soil is also used as woodland and is moderately suited to the production of pine and hardwood trees.

The main limitation for woodland use is the clayey subsoil. The dominant trees are post oak, southern red oak, sweetgum, loblolly pine, and shortleaf pine. This soil is well suited to the production of understory plants that can be grazed by livestock and game animals. Major understory plants are longleaf uniola, pinehill bluestem, splitbeard bluestem, pineywoods dropseed, greenbrier, and yaupon.

This soil generally is not used for crops, but it is suited to cotton, corn, grain sorghum, and small grains. Erosion is a hazard in cropland areas.

This soil is moderately suited to dwellings, roads, streets, and sanitary facilities. The main limitation is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Trawick soil is in capability subclass IIIe. The woodland ordination symbol is 8C.

TxE—Trawick-Bub complex, 8 to 20 percent slopes. This complex consists of strongly sloping to moderately steep, deep and shallow soils on uplands. These soils are well drained. They are on moderately steep side slopes that form a cuesta across the east side of the county. The areas of these soils are long and narrow and range from 5 to 1,250 acres.

The Trawick soil is deep and is in less sloping parts of the complex. The Bub soil is shallow and is in steeper areas. This complex is about 60 percent Trawick soil and about 30 to 40 percent Bub soil. Some areas contain about 10 percent cobbles and stones on the surface. These soils are too intricately mixed to be mapped separately at the selected scale.

Typically, the Trawick soil has a neutral, dark reddish brown clay loam surface layer about 5 inches thick. The subsoil to a depth of 42 inches is very strongly acid, red clay that has yellowish brown mottles in the lower part. The substratum to a depth of 60 inches is strongly acid, brownish yellow and red ironstone and weathered glauconitic material.

Typically, the Bub soil has a slightly acid, dark reddish brown gravelly clay loam surface layer about 3 inches thick. The subsoil to a depth of 18 inches is very strongly acid, red clay that has yellow mottles in the lower part. The substratum to a depth of 80 inches is medium acid, yellowish brown and dark reddish brown ironstone and weathered glauconitic material.

These soils have moderately slow permeability, and runoff is rapid. The available water capacity is moderate in the Trawick soil and very low in the Bub soil. Water erosion is a severe hazard on these soils.

Included with this complex in mapping are small areas of Elrose soils. These soils are on the foot slopes. Also included are soils that are calcareous to the surface and have had most of the soil removed by erosion and areas of soils that have nearly vertical slopes.

The soils of this complex are used mainly as woodland; however, they are poorly suited to production of timber. The main limitations for woodland use are steepness of slope and the clayey texture of the subsoil. The shallow depth of the Bub soil is also a limitation. Shortleaf pine and loblolly pine are suitable trees to plant on these soils. The clayey subsoil and droughtiness limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, splitbeard bluestem, yellow indiangrass, pineywoods dropseed, longleaf uniola, yaupon, and greenbrier.

In some areas, the Trawick and Bub soils are used as pasture or hayland. These soils are poorly suited to these uses because of steepness of slope, droughtiness, and the clayey subsoil. The shallow depth of the Bub soil is also a limitation. Common bermudagrass, improved bermudagrass, and bahiagrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, and vetch, overseeded into the grass, prolong the grazing season and improve the soil. Fertilizer and lime are needed to maintain yields.

These soils are not suited to crop production because of the severe hazard of erosion and the steepness of slope.

These soils are poorly suited to buildings, roads, streets, and sanitary facilities. Major limitations are steepness of slope and depth to bedrock. Low strength is an additional limitation for roads and streets.

The Trawick and Bub soils in this complex are in capability subclass VIe. The woodland ordination symbol is 8C for the Trawick soil and 6F for the Bub soil.

WcA—Wilson clay loam, 0 to 1 percent slopes. This soil is deep, nearly level, and somewhat poorly drained. It is in small, smooth areas on ancient terraces and uplands. The areas of this soil are irregular in shape and range from 5 to 75 acres.

Typically, the surface layer is medium acid, very dark gray clay loam about 7 inches thick. The subsoil to a depth of 26 inches is medium acid, very dark gray clay. To a depth of 56 inches, it is dark gray clay that is medium acid in the upper part and moderately alkaline in the lower part. To a depth of 80 inches, the soil is moderately alkaline, light brownish gray clay that has light gray and brownish yellow mottles.

Permeability is very slow, and the available water capacity is high. Runoff is slow. Water erosion is a slight hazard.

Included with this soil in mapping are areas of Axtell, Crockett, Lufkin, Mabank, and Tabor soils. Axtell, Crockett, and Tabor soils are in slightly higher positions on the landscape than the Wilson soil. Lufkin and Mabank soils are in positions similar to those of the Wilson soil. The included soils make up less than 15 percent of the map unit.

This Wilson soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, kleingrass, and johnsongrass are the main forage. Arrowleaf clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the growing season and improve the soil. The main limitations are wetness and the dense clayey subsoil. Fertilizer is needed to sustain forage yields.

This soil is also used as rangeland and is well suited to this use. The climax vegetation is a tall grass prairie with a few elm and hackberry trees along drainageways.

This Wilson soil is suited to crops, such as corn, cotton, grain sorghum, and small grains; however, wetness and the dense clayey subsoil are limitations. The surface crusts when the soil is dry, making seedling emergence difficult.

The main limitations for dwellings, roads, streets, and sanitary facilities are wetness, the very slow permeability, and the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets.

This Wilson soil is in capability subclass IIIw and in the Claypan Prairie range site.

WoC—Wolfpen loamy fine sand, 1 to 8 percent slopes. This soil is deep, gently sloping and strongly sloping, and well drained. It is on broad ridges and side slopes on uplands. The areas of this soil are irregular in shape to oblong and range from 10 to 1,780 acres.

Typically, the surface layer is slightly acid, dark grayish brown loamy fine sand about 3 inches thick. The subsurface layer to a depth of 30 inches is medium acid loamy fine sand. It is light yellowish brown in the upper part and very pale brown in the lower part. The subsoil to a depth of 55 inches is very strongly acid, mottled red, gray, and brown sandy clay loam. To a depth of 80 inches, the soil is very strongly acid, pale brown sandy clay loam that has dark red and strong brown mottles.

Permeability is moderate, and the available water capacity is moderate. Runoff is slow. Water erosion is a moderate hazard. Soil blowing is a hazard in bare areas and on construction sites.

Included with this soil in mapping are areas of Cuthbert, Larue, Lummus, Oakwood, Pickton, and Tenaha soils. Cuthbert and Tenaha soils are on steeper side slopes than the Wolfpen soil. Larue, Oakwood, and Pickton soils are in positions similar to those of the Wolfpen soil. Lummus soils are on lower side slopes and in concave areas. The included soils make up less than 15 percent of the map unit.

This Wolfpen soil is used mainly as pasture or hayland. Improved bermudagrass and weeping lovegrass are the main forage. The main limitation is droughtiness. Pastures require light applications of fertilizer and lime at frequent intervals for high production. Legumes, such as vetch, crimson clover, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil.

This Wolfpen soil is also used as woodland. It is moderately suited to the production of pine and hardwood trees. The main limitation is droughtiness, which affects seedling mortality. The dominant trees are loblolly pine, shortleaf pine, southern red oak, post oak, hickory, and sweetgum. Droughtiness, plant competition, and the rapid increase in tree canopy limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are longleaf uniola, pinehill bluestem, purpletop, pineywoods dropseed, low panicums, American beautyberry, dogwood, and yaupon.

This soil is used for crops in only a few areas. It is suited to such crops as corn, peanuts, peas, sweet potatoes, and watermelons. Cover crops, high residue crops, and green manure crops help control erosion and maintain fertility. Fertilizer and lime are needed for good yields.

This soil is well suited to dwellings, roads, streets, and sanitary facilities.

This Wolfpen soil is in capability subclass IIIs. The woodland ordination symbol is 8S.

WtC—Woodtell fine sandy loam, 1 to 5 percent slopes. This soil is deep, gently sloping, and moderately well drained. It is on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 5 to 660 acres.

Typically, the surface layer is medium acid, grayish brown fine sandy loam about 5 inches thick. The subsurface layer to a depth of 8 inches is medium acid, very pale brown fine sandy loam. The subsoil extends to a depth of 48 inches. It is very strongly acid clay that is red in the upper part and light brownish gray in the lower part. The substratum to a depth of 60 inches is very strongly acid, stratified clayey shale and sandstone.

Permeability is very slow, and the available water capacity is moderate. Runoff is slow to rapid. Water erosion is a moderate hazard.

Included with this soil in mapping are areas of Cuthbert, Kirvin, Lummus, Oakwood, and Rader soils. Cuthbert and Kirvin soils are in higher positions on the landscape than the Woodtell soil. Lummus and Rader soils are at the head of drainageways and on toe slopes. Oakwood soils are in positions similar to those of the Woodtell soil. The included soils make up less than 15 percent of the map unit.

This Woodtell soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. A complete fertilizer and lime are needed for sustained production. The main limitation for use as pasture or hayland is the dense clayey subsoil.

This soil is also used as woodland and is moderately suited to the production of pine and hardwood trees. The main limitation for woodland use is the dense clayey subsoil. Dominant trees are loblolly pine, shortleaf pine, and mixed hardwoods. The dense clayey subsoil limits the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, splitbeard bluestem, yellow indiangrass, pineywoods dropseed, longleaf uniola, yaupon, and greenbrier.

This soil generally is not used for crops because of the hazard of erosion and the dense clayey subsoil.

The main limitation for dwellings, streets, and roads is the shrinking and swelling of the soil with changes in moisture content. Low strength is an additional limitation for roads and streets. The very slow permeability restricts the use of this soil as septic tank absorption fields.

This Woodtell soil is in capability subclass IIIe. The woodland ordination symbol is 8C.

WtD—Woodtell fine sandy loam, 5 to 12 percent slopes. This soil is deep, strongly sloping, and moderately well drained. It is on uplands. The areas of this soil are mostly oblong to irregular in shape and range from about 10 to 1,090 acres.

Typically, the surface layer is medium acid, dark grayish brown fine sandy loam about 5 inches thick. The subsurface layer to a depth of about 10 inches is slightly acid, pale brown fine sandy loam. The subsoil to a depth of 18 inches is very strongly acid, red clay. To a depth of 48 inches, it is very strongly acid, mottled red and gray clay. The gray increases with depth. Below a depth of 48 inches, the soil is stratified shaly clay and clay loam.

Permeability is very slow, and the available water capacity is moderate. Runoff is rapid. Water erosion is a severe hazard.

Included with this soil in mapping are areas of Cuthbert, Kirvin, and Lummus soils. Cuthbert and Kirvin soils are in higher positions on the landscape than the Woodtell soil, mainly on crests of hills and breaks. Lummus soils are on toe slopes and at the head of drainageways. The included soils make up less than 15 percent of the map unit.

This Woodtell soil is used mainly as pasture or hayland. Common bermudagrass, improved bermudagrass, bahiagrass, weeping lovegrass, kleingrass, and johnsongrass are the main forage. Legumes, such as arrowleaf clover, crimson clover, subterranean clover, vetch, and singletary peas, overseeded into the grass, prolong the grazing season and improve the soil. The main limitations are steepness of slope and the dense clayey subsoil. A complete fertilizer and lime are needed for sustained production.

This soil is also used as woodland. It is moderately suited to the production of pine and hardwood trees. The main limitation for woodland use is the dense clayey subsoil. Dominant trees are loblolly pine, shortleaf pine, and mixed hardwoods. Steepness of slope and the dense clayey subsoil limit the production of understory plants that can be grazed by livestock and game animals. Major understory plants are pinehill bluestem, splitbeard bluestem, yellow indiangrass, pineywoods dropseed, longleaf uniola, yaupon, and greenbrier.

This soil is not used as cropland because of the steepness of slope and severe hazard of erosion.

The main limitations for dwellings, streets, roads, and sanitary facilities are steepness of slope, shrinking and swelling of the soil, and very slow permeability. Low strength is an additional limitation for roads and streets.

This Woodtell soil is in capability subclass VIe. The woodland ordination symbol is 8C.

Prime Farmland

In this section, prime farmland is defined and discussed, and the prime farmland soils in Leon County are listed.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 5 percent.

Only about 14 percent of the soils in Leon County is prime farmland. Areas of these soils are scattered throughout the county. The following map units, or soils, make up prime farmland in Leon County. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Soils that have limitations, such as a high water table or flooding, may qualify as prime farmland if these limitations are overcome by such measures as drainage or flood control. In the following list, the measures needed to overcome the limitations of a map unit are shown in parentheses after the map unit name. Onsite evaluation is necessary to determine if the limitations have been overcome by the corrective measures.

AtB	Attoyac fine sandy loam, 0 to 3 percent slopes
BeB	Benchley clay loam, 1 to 5 percent slopes
BuA	Burleson clay, 0 to 1 percent slopes
BuB	Burleson clay, 1 to 3 percent slopes
ChB	Chazos loamy fine sand, 1 to 5 percent slopes
DmA	Dimebox silty clay, 0 to 1 percent slopes
GaA	Garner clay, 0 to 1 percent slopes (where drained)
GfB	Gasil fine sandy loam, 1 to 5 percent slopes
Ka	Kaufman clay, occasionally flooded
LeB	Lexton clay loam, 1 to 3 percent slopes
LmB	Lummus fine sandy loam, 1 to 5 percent slopes
MgB	Margie fine sandy loam, 1 to 5 percent slopes
OkB	Oakwood fine sandy loam, 1 to 5 percent slopes
RaB	Rader fine sandy loam, 1 to 3 percent slopes
Rd	Rader-Derly complex, gently undulating
SaB	Silawa fine sandy loam, 1 to 5 percent slopes
TrB	Trawick fine sandy loam, 1 to 5 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

William Miller, agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Crops

Cropland is of minor extent in Leon County. Most cropland areas are along roads and near homesites. The areas are used for gardens and for growing crops and livestock feed. The crops are corn, oats, grain sorghum, soybeans, wheat, cotton, peanuts, sweet potatoes, and watermelons.

Management is needed to control water erosion, maintain tilth and fertility, and in some cases, drain off excess water. The major practices used to accomplish these purposes are conservation cropping sequence, conservation tillage, terracing and contour farming, cover crops, and proper fertilizer use.

Soil erosion is the major problem on nearly all of the cropland where slopes are more than 2 percent. Loss of the surface layer through erosion is damaging. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Soil erosion on farmland also results in sediment entering streams. Where erosion is controlled, the pollution of streams by sediment is minimized and the quality of water for municipal use, for recreation, and for fish and wildlife is improved.

Management of residue helps control erosion. A good litter of crop residue left on the surface of the soil protects against packing rains, reduces crusting, decreases runoff, and reduces evaporation of soil moisture. It shades the soil and thus reduces the soil temperature. In addition, it adds organic matter to the soil, improves tilth, and reduces compaction by farm machinery. Crop residue should be protected from overgrazing and burning. Tillage equipment that keeps residue on the surface should be used. Minimum tillage is effective in reducing erosion on sloping land and can be adapted to most of the soils that are now being cropped.

Contour terraces reduce runoff and subsequent erosion. They are most practical on deep and moderately deep, clayey and loamy soils that have slopes of more than 1 percent.

Most crops respond well to commercial fertilizer. Where the proper amounts and kinds of fertilizer are applied and proper management is used, soil fertility levels can be maintained.

Information on soil management practices can be obtained at the local office of the Soil Conservation Service.

Pasture and Hay

Pasture and hay are important in Leon County because raising livestock is the main farm enterprise (fig. 14). For several years, the trend has been to convert land from other uses to pasture or hay. Land used for pasture or hay is planted mainly to introduced grasses that respond to good management.

Some of the pasture plants used in Leon County are common and improved varieties of bermudagrass, weeping lovegrass, bahiagrass, kleingrass-75, johnsongrass, switchgrass, Dallisgrass, and fescue. Grazing programs often include bermudagrass overseeded with crimson clover, subterranean clover, arrowleaf clover, vetch, or singletary peas.

Year-round forage programs can be developed by planning land use and the kinds of forage to be grown. Such a planned grazing system increases the production by providing for timely rest periods from grazing, for livestock management, and for a more efficient forage harvest.

Well managed pastures require an adequate fence arrangement for rotation grazing and the efficient use of forage. Proper use of forage insures that plants retain vigor. In a well managed pasture, weeds are controlled, fertilization is at the proper time and in the proper amounts, and an adequate supply of water for livestock is available. Many pastures need applications of agricultural limestone to correct acidity problems and release fertilizer amendments for use by plants.

Well managed hay production requires the selection of the more productive kinds of grass and the application of fertilizer at the correct time and in adequate amounts. Forage is cut at the proper intervals to provide for high quality, and cutting heights are adequate to maintain plant vigor and timely regrowth.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland *(15)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major,

Figure 14.—Raising livestock is an important enterprise in Leon County. This pasture is on Wolfpen loamy fine sand, 1 to 8 percent slopes.

and generally expensive, landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey and are shown for each soil in table 5. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode, but they have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, or *s*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w* or *s*.

Rangeland

Rhett H. Johnson, state range conservationist, John C. Copeland, area plant scientist, and Linda Campbell-Kissock, range conservationist, Soil Conservation Service, helped prepare this section.

The native forage of Leon County is made up of rangeland vegetation and of woodland understory vegetation. Rangeland is in the Texas Claypan Area and Texas Blackland Prairie Major Land Resource Areas. It is in the western part of the county and includes soils in general soil map units 2, 3, 5, 6, and 7. Woodland is in the Western Coastal Plain Major Land Resource area. It is in the eastern part of the county and includes soils in general soil map units 1, 4, 8, 11, and 12. Units 9, 10, and 13 have both rangeland and woodland.

Rangeland is land on which native vegetation consists of a wide variety of grasses, grass-like plants, forbs, shrubs, and trees. Rangeland receives no regular or frequent cultural treatment. Management to conserve the soil and water and improve production is accomplished by balancing livestock numbers to forage production and by rotating livestock to allow desirable plants to improve vigor, produce seed, and establish seedlings.

Woodland understory vegetation consists of grasses, forbs, shrubs, and other plants. The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, the depth and condition of litter, and the grazing management applied to the understory vegetation.

The rangelands of Leon County, when first settled, were an open post oak, blackjack oak savannah. The savannah typically was an open stand of individual trees or motts of trees with indiangrass, little bluestem, big bluestem, switchgrass, beaked panicum, native legumes, and forbs growing between the trees. Wildfire was a natural part of the rangeland ecosystem. Wildfires repeatedly burned the area, which helped to control the spread and thickening of the oaks and underbrush and to perpetuate the production of the tall grasses, legumes, and forbs.

After the county was settled, a number of events changed range vegetation. Wildfires were suppressed, fences were constructed, and domestic livestock was confined, which caused overgrazing of the tall, productive grasses. This led to a rapid increase in canopy of oak and associated brush species that shaded the understory plant community, thereby reducing the sun-loving tall grasses and increasing the shade-tolerant forage plants, such as longleaf uniola, and cool-season plants, such as Texas wintergrass. Forage production is now limited on these thicketed oak ranges that once were lush grasslands with only scattered oak trees.

In order to return the rangelands of Leon County to their natural productive state, the oak canopy must be reduced to the savannah aspect. This can be accomplished by prescribed burning (fig. 15), the application of herbicides, or by mechanical means. When the canopy is reduced, the suppressed tall grasses once again have the necessary sunlight for growth. A good grazing management program is essential along with brush management to reestablish the once productive rangeland.

Range management requires a knowledge of the kinds of soil and of the climax vegetation. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the climax vegetation on a particular range site. The more closely the existing community resembles the climax vegetation, the better the range condition.

A primary objective of good range management is to keep the range in excellent or good condition to conserve water, improve yields, and protect the soil. The main management concern is recognizing important changes in the kind of cover on a range site. These

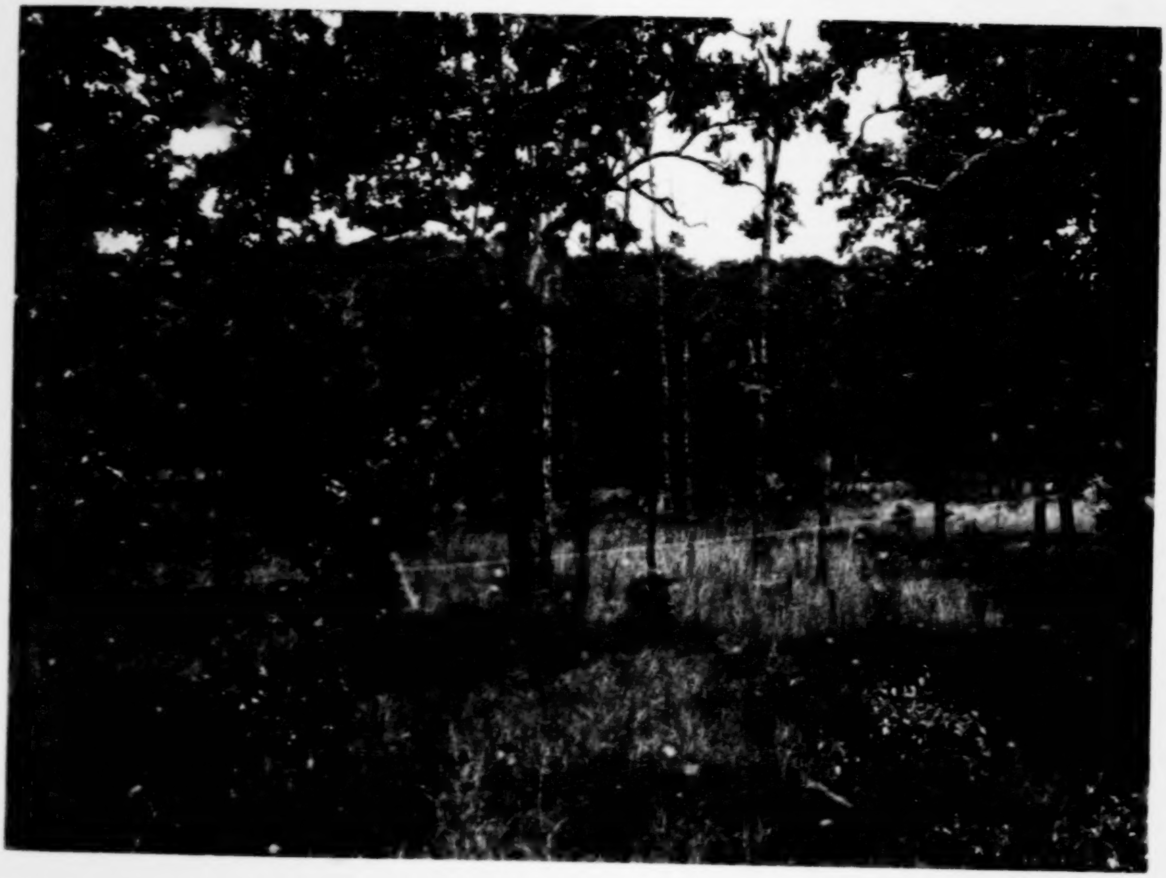

Figure 15.—This area of Padina loamy fine sand, 1 to 8 percent slopes, was once a dense growth of post oak and blackjack oak. Repeated prescribed burns reduced the brush competition and allowed grasses to produce quality forage for livestock and wildlife.

changes take place gradually and can be misinterpreted or overlooked. Growth encouraged by heavy rainfall can lead to the conclusion that the range is in good condition when, actually, the cover is weedy and the long-term trend is toward lower production. Otherwise, some rangeland that has been closely grazed for short periods under careful supervision can have a degraded appearance that temporarily conceals its quality and ability to recover.

Range Sites and Condition Classes

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship of the soils, vegetation, and water.

Table 6 shows, for each soil, the range site and the potential annual production of vegetation in favorable, average, and unfavorable years. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 6 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, or proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Potential production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the climax plant community. Potential production includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants, but it does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, average, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Range management requires a knowledge of the kinds of soil and of the potential climax plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the climax plant community on a particular range site. The more closely the existing community resembles the climax community, the better the range condition. Range condition is an ecological rating only. It does not have a specific meaning that pertains to the present plant community in a given use.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the climax plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Climax vegetation on the range site is the stabilized plant community that reproduces itself and changes very little as long as the environment remains unchanged. The climax vegetation consists of the plants that grew in the area when it was first settled. The most productive combination of forage plants on a range site is generally the climax vegetation.

Decreasers are plants in the climax vegetation that tend to decrease in relative amount under close grazing. They generally are the tallest and most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreasers are reduced by close grazing. The increasers generally are shorter than decreasers and less palatable to livestock.

Invaders are plants that cannot compete with the climax vegetation for moisture, nutrients, and light. The invaders come in and grow along with increasers after the climax vegetation has been reduced by grazing.

Range condition is judged according to standards that apply to the particular range site. It expresses the present kind and amount of vegetation in relation to the climax plant community for that site.

Four range condition classes are used to indicate the degree of departure from the potential, or climax, vegetation brought about by grazing or other uses. The classes show the present condition of the native vegetation on a range site in relation to the native vegetation that could grow there. A range is in excellent condition if 76 to 100 percent of the vegetation is of the same kind as that in the climax stand, in good condition if the percentage is 51 to 75, in fair condition if the percentage is 26 to 50, and in poor condition if the percentage is 25 or less.

Potential forage production depends on the range site. Current forage production depends on the range condition and the moisture available to plants during their growing season.

Following years of prolonged overuse of range, seed sources of desirable vegetation will be eliminated. In such instances, vegetation can be reestablished by applying one or a combination of the following practices: brush control, range seeding, fencing, water development, or other mechanical treatment to revitalize stands of native plants. Thereafter, deferred grazing, proper grazing use, and planned grazing systems can maintain and improve the range.

Good management generally results in the optimum production of vegetation, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs.

The 15 range sites in the survey area are: Blackland, Clayey Bottomland, Clay Loam, Claypan Savannah, Claypan Prairie, Deep Redland, Deep Sand, Eroded Blackland, Flatwoods, Loamy Bottomland, Loamy Sand, Sandy, Sandstone Hills, Sandy Loam, and Very Deep Sand.

Table 7 lists the percent of plants in the characteristic vegetation of each range site that occurs in Leon County. Composition is expressed as a percentage of total production on an air-dry basis. In each column, percentages followed by the same letter are grouped together to equal the indicated percentage. For example, if three plants are each identified with a 10a percentage, the three plants together equal 10 percent of the total composition in the climax state.

Blackland Range Site

The Burleson and Dimebox soils in map units BuA, BuB, and DmA are in the Blackland range site. The climax vegetation is a tall grass prairie with a few large live oak, elm, and hackberry trees along the draws and in occasional motts. The composition by weight is 85 percent grasses, 5 percent woody plants, and 10 percent forbs. This site has high natural fertility.

Little bluestem, indiangrass, and big bluestem produce 75 percent of the forage in climax condition. Many other grasses, mainly switchgrass, sideoats grama, Texas wintergrass, Texas cupgrass, tall dropseed, silver bluestem, longspike tridens, Florida paspalum, and Virginia wildrye, make up the other 10 percent. Woody plants are live oak, elm, hackberry, bumelia, and coralberry. About 34 forbs grow on this site.

Overgrazing by cattle eventually kills out the little bluestem, big bluestem, indiangrass, switchgrass, and eastern gamagrass. These are replaced by silver bluestem, Texas wintergrass, sideoats grama, tall dropseed, and other mid grasses. If these are overgrazed, buffalograss will dominate the site with annual forbs and an invasion of mesquite, huisache, osageorange, winged elm, honeylocust, Texas grama, and tumblegrass.

Clayey Bottomland Range Site

The Gladewater and Kaufman soils in map units Gg, Gh, Gp, Ka, Kf, and Kg are in the Clayey Bottomland range site. The climax plant community is a tall grass savannah with a 30 percent canopy. The canopy generally is heavier adjacent to the stream. Cool-season grasses and sedges grow under the canopy, and warm-season grasses and forbs dominate the openings. The composition by weight is 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

Sedges, Virginia wildrye, Canada wildrye, and rustyseed paspalum produce 35 percent of the composition by weight. Beaked panicum, switchgrass, indiangrass, little bluestem, big bluestem, eastern gamagrass, vine mesquite, and Florida paspalum produce 25 percent. Buffalograss, longleaf uniola, knotroot bristlegrass, and other grasses produce 10 percent. Woody plants include oak, elm, cottonwood, hackberry, black willow, pecan, and hawthorn trees and woody vines. The forbs are tickclover, snoutbean, lespedeza, and gayfeather.

This is a preferred range site by livestock. Heavy grazing and suppression of fire reduce the warm-season grasses and forbs and allow the brush to form a dense canopy. Shade-tolerant grasses then dominate the herbaceous production, and total usable forage is drastically reduced.

Clay Loam Range Site

The Benchley soils in map units BeB and BeD are in the Clay Loam range site. The climax plant community is a tall grass prairie that is highly productive. The composition by weight is 90 percent grasses, 5 percent woody plants, and 5 percent forbs.

About 70 percent of the climax plant community is little bluestem, indiangrass, big bluestem, and switchgrass. Sideoats grama, Florida paspalum, Canada wildrye, silver bluestem, tall dropseed, and Texas wintergrass make up 15 percent. Other short grasses, such as buffalograss, make up 5 percent. The woody plants include hackberry, elm, pecan, and oak. The forbs are Maximilian sunflower, Engelmann daisy, and bundleflower.

Continued overgrazing by cattle decreases big bluestem, little bluestem, indiangrass, switchgrass, Florida paspalum, and palatable forbs. These grasses are replaced by increasers, such as sideoats grama, silver bluestem, Texas wintergrass, tall dropseed, low panicums, and less palatable forbs. If these are grazed out, the site will be dominated by buffalograss, Texas wintergrass, Texas grama, hairy grama, threeawn, windmillgrass, tumblegrass, western ragweed, and prairie coneflower and by woody plants, such as mesquite.

Claypan Savannah Range Site

The Axtell, Derly, and Lufkin soils in map units AxA, AxB, AxD, De, Df, LfA, and Rd are in the Claypan Savannah range site. The climax plant community is a post oak, blackjack oak savannah with trees shading 20 to 25 percent of the ground. The composition by weight is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax vegetation is made up of little bluestem, indiangrass, and brownseed paspalum. The other grasses are switchgrass, Florida paspalum, purpletop, low panicums, low paspalums, silver bluestem, tall dropseed, and Texas wintergrass. Woody plants include post oak, blackjack oak, elm, yaupon, hawthorn, and American beautyberry. Forbs include dayflower, bundleflower, sensitivebrier, tickclover, wildbean, and lespedeza.

If retrogression occurs as a result of heavy grazing or fire suppression, or both, little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, silver bluestem, arrowfeather threeawn, tall dropseed, purpletop, and low panicums. Woody plants, such as post oak, elm, yaupon, and hackberry, increase and form a dense canopy that suppresses grass and forb production.

Claypan Prairie Range Site

The Crockett, Mabank, and Wilson soils in map units CrB, CrD, CsB, MaA, and WcA are in the Claypan Prairie range site. The climax plant community is a tall grass prairie with a few scattered live oak, elm, and hackberry trees occurring along watercourses or in occasional motts.

Little bluestem and indiangrass compose 65 percent of the climax plant community. Switchgrass, big bluestem, Virginia wildrye, Canada wildrye, Florida paspalum, sideoats grama, meadow dropseed, Texas wintergrass, and vine mesquite produce 15 percent. Purpletop, brownseed paspalum, longspike tridens, buffalograss, low panicums, fall switchgrass, and sedges make up 5 percent. Live oak, elm, hackberry, bumelia, coralberry, and an occasional post oak make up 5 percent of the total production. Many forbs, such as Maximilian sunflower, Engelmann daisy, halfshrub sundrop, western indigo, and prairie-clover produce 10 percent of the composition.

Continued overgrazing by cattle decreases big bluestem, little bluestem, indiangrass, and switchgrass. Meadow dropseed, silver bluestem, sideoats grama, and Texas wintergrass increase. Finally, mesquite and pricklypear invade the site; buffalograss, Texas wintergrass, Texas grama, windmillgrass, and weedy forbs dominate the site.

Deep Redland Range Site

The Flynn, Lexton, and Margie soils in map units FyC, JmE, LeB, MgB, MgD, and MhC are in the Deep Redland range site. The climax plant community is an oak savannah with post oak, red oak, blackjack oak, and associated woody plants shading from 25 to 30 percent of the ground. The composition by weight is about 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 60 percent of the climax vegetation is made up of little bluestem, indiangrass, and beaked panicum. The other grasses are big bluestem, Florida paspalum, purpletop, sand lovegrass, longleaf uniola, silver bluestem, splitbeard bluestem, and tall dropseed. Woody plants include post oak, blackjack oak, red oak, elm, hackberry, hawthorn, and yaupon. Forbs include sensitivebrier, bundleflower, tickclover, yellow neptunia, wildbean, and lespedeza.

If retrogression occurs as a result of heavy grazing, little bluestem, indiangrass, beaked panicum, and big bluestem are replaced by purpletop, longleaf uniola, sand lovegrass, silver bluestem, splitbeard bluestem, tall dropseed, and low panicums. If heavy grazing continues and fire is suppressed for many years, woody plants increase until the savannah canopy closes. As the overstory canopy increases, shade-tolerant plants, such as longleaf uniola, low panicums, and sedges, increase.

Deep Sand Range Site

The Eufaula and Padina soils in map units EuB, PaC, and PaD are in the Deep Sand range site. The climax vegetation is a bluejack oak, blackjack oak, post oak savannah with a 20 to 25 percent canopy. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

About 65 percent of the composition is little bluestem, indiangrass, switchgrass, sand lovegrass, and purpletop. Other grasses are low panicums, low paspalums, purple lovegrass, sand dropseed, and splitbeard bluestem. Woody plants, such as bluejack oak, blackjack oak, and post oak, make up 10 percent of the composition. Other woody plants include shrubs, such as yaupon, hawthorn, and American beautyberry. The forbs include lespedeza, tickclover, wildbean, and partridge pea.

As retrogression takes place, little bluestem, sand lovegrass, indiangrass, and purpletop decrease and low panicums, low paspalums, purple lovegrass, and woolysheath threeawn increase on the site. Oak and yaupon increase to form a dense canopy. The decreasing and increasing plants are finally replaced by red lovegrass, tumble lovegrass, crabgrass, red sprangletop, sandbur, brackenfern, pricklypear, and queensdelight. Production of forage species is reduced to nothing.

Eroded Blackland Range Site

Ferris soils in map units FeB and FeD are in the Eroded Blackland range site. The climax plant community has been destroyed by cultivation, and the natural productivity lowered through erosion. The potential plant community is a tall grass prairie much like the Blackland range site. A long period of time is needed for secondary plant succession to reestablish the plant community. The potential plant community by weight is 85 percent grasses, 5 percent woody plants, and 10 percent forbs.

Little bluestem, indiangrass, and big bluestem make up 70 percent of the potential plant community, and Virginia wildrye, Canada wildrye, switchgrass, Florida paspalum, sideoats grama, tall dropseed, silver bluestem, Texas wintergrass, and vine mesquite make up 15 percent. Live oak, hackberry, elm, bumelia, and coralberry produce 5 percent of the composition, and many forbs, such as Maximilian sunflower, Englemann daisy, and bundleflower, produce 10 percent.

Most of this site is in some intermediate stage of secondary plant succession. Silver bluestem, tall dropseed, Texas wintergrass, sideoats grama, and buffalograss normally dominate this condition, and they respond as increasers. If heavy use is continued, buffalograss or Texas wintergrass, or both, will dominate the site.

Flatwoods Range Site

The Melhomes soil in map unit Ms is in the Flatwoods range site. The climax plant community is an open stand of oaks and associated hardwood trees, shrubs, and woody vines with a tall grass understory. The overstory shades 25 to 35 percent of the ground. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

Little bluestem and beaked panicum make up about 40 percent of the understory. Big bluestem, indiangrass, switchgrass, eastern gamagrass, and other tall grasses make up about 15 percent. Virginia wildrye, sedges, wintergrass, longleaf uniola, and low panicums make up about 15 percent of the plant community, and brownseed paspalum makes up about 5 percent. Water oak, willow oak, red oak, post oak, hickory, sweetgum, and elm make up 15 percent of the total production. Other woody plants make up about 5 percent and include many vines along with yaupon and American beautyberry. The forbs are gayfeather, tickclover, lespedeza, tephrosia, and partridge pea.

As retrogression of the climax plant community occurs, trees and underbrush increase on the site. Overgrazing and increased shading of the understory decrease the warm-season grasses, and they are replaced by Virginia wildrye, sedges, longleaf uniola, and many low panicums.

Loamy Bottomland Range Site

The Gowker, Hatliff, Nahatche, and Nugent soils in map units Gw, Ha, Na, and Nu are in the Loamy Bottomland range site. The climax plant community is a tall grass savannah with trees shading 30 percent of the ground. Cool-season grasses and sedges dominate the shaded areas, while warm-season plants dominate the openings. The composition by weight is 70 percent grasses, 25 percent woody plants, and 5 percent forbs.

Virginia wildrye, sedges, and rustyseed paspalum grow in the shaded and wet areas. They make up 25 percent of the composition. Switchgrass, beaked panicum, indiangrass, big bluestem, little bluestem, eastern gamagrass, vine mesquite, and purpletop grow in the open areas and make up 35 percent of the plant community. Redtop panicum, gaping panicum, low panicums, uniolas, buffalograss, knotroot bristlegrass, Texas wintergrass, and other grasses make up 10 percent. The woody plants include oaks, pecan, hackberry, elm, cottonwood, black willow, sycamore, hickory, ash, and many other underbrushes. The forbs are tickclover, lespedeza, snoutbean, partridge pea, and gayfeather.

This is a preferred site by livestock. Overgrazing and fire suppression reduce warm-season grasses and forbs and increase the tree and brush canopy. Shade-tolerant grasses and forbs then dominate the herbaceous production, and forage production is drastically reduced.

Sandy Range Site

The Dutek, Robco, and Silstid soils in map units DuC, RoC, RxC, and SdB are in the Sandy range site. The climax vegetation is an open savannah of post oak and blackjack oak, which shade 25 to 30 percent of the ground. The interspaces are predominantly tall grasses. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs.

About 50 percent of the composition is little bluestem, with indiangrass making up 10 percent. Switchgrass, beaked panicum, sand lovegrass, purpletop, and brownseed paspalum total 10 percent. Other grasses are fringeleaf paspalum, purple lovegrass, tall dropseed, splitbeard bluestem, and low panicums. Post oak and blackjack oak make up about 15 percent of the total annual production. Woody plants in the understory are hawthorn, American beautyberry, greenbrier, yaupon, and berry vines. The forbs are lespedeza, tickclover, sensitivebrier, snoutbean, tephrosia, partridge pea, and western ragweed.

With continuous overgrazing and the lack of natural fires, the taller grasses are grazed out or shaded out, or both, by an increasing canopy of woody species. The little bluestem, indiangrass, and switchgrass are replaced by brownseed paspalum, tall dropseed, fall witchgrass, and other increasing species. They, in turn, are grazed out and replaced by red lovegrass, yankeeweed, bullnettle, snakecotton, and croton. Other invading plants are broomsedge bluestem, smutgrass, sandbur, pricklypear, queensdelight, beebalm, pricklypoppy, baccharis, and waxmyrtle. Woody species increase and invade to form dense thickets.

Sandstone Hills Range Site

The Hearne and Jedd soils in map units HsE, HxE, and JmE are in the Sandstone Hills range site. The climax plant community is a savannah of moderate-size post oak and blackjack oak associated with an open stand of mid and tall grasses. The composition by weight is 70 percent grasses, 20 percent woody plants, and 10 percent forbs.

Little bluestem is the dominant grass, making up 35 percent of the plant community. Purpletop, a more shade-tolerant grass, makes up 15 percent, and indiangrass and beaked panicum combine to equal about 10 percent. Numerous other tall and mid grasses make up 10 percent. Post oak and blackjack oak make up 15 percent of the annual production. Other woody plants include greenbrier, dewberries, coralberry, St. Andrews cross, and American beautyberry. The forbs include lespedeza, wildbean, yellow neptunia, tickclover, snoutbean, catclaw sensitivebrier, phlox, dayflower, and many annual plants.

As retrogression occurs, little bluestem decreases and the woody overstory of oak increases, creating a shaded habitat unsuitable for most climax grasses. Continual deterioration of the site results in an increase in oak overstory and woody shrubs and vines. Under prolonged abuse, eastern redcedar, winged elm, yaupon, sumac, western ragweed, broomsedge bluestem, splitbeard bluestem, tumblegrass, red threeawn, and pricklypear invade the site.

Sandy Loam Range Site

The Chazos, Gasil, Hearne, Marquez, Rader, Silawa, and Tabor soils in map units ChB, Df, GfB, GfD, HeB, HeE, MkB, MrB, RaB, Rd, SaB, SaD, and TaB are in the Sandy Loam range site. The climax vegetation is a post oak and blackjack oak savannah with a 20 to 25 percent canopy. Tall grasses fill the interspaces between the oak. The composition by weight is 80 percent grasses, 15 percent woody plants, and 5 percent forbs.

The predominant grass on this site is little bluestem, making up 50 percent of the composition. Indiangrass is the next dominant grass, making up about 10 percent. Eastern gamagrass, switchgrass, big bluestem, beaked panicum, and longleaf uniola make up 10 percent of the total composition, and numerous other grasses make up another 10 percent. Post oak and blackjack oak make up about 10 percent of the total annual production, and numerous other woody plants include elm, yaupon, greenbrier, American beautyberry, and berry vines. The forbs include Engelmann daisy, gayfeather, sensitivebrier, and native legumes.

If occurrence of wildfires is reduced and if overgrazing continues, this range site deteriorates, with an increase in woody canopy and a decline in tall grasses, such as little bluestem, indiangrass, big bluestem, and eastern gamagrass. These plants are replaced by an increase in such plants as brownseed paspalum. If overgrazing persists, the sites deteriorate to thickets of oak and brush, annual grasses, forbs, and carpetgrass.

Very Deep Sand Range Site

The Arenosa soil in map unit ArC is in the Very Deep Sand range site. The climax vegetation is a bluejack oak, post oak, blackjack oak, and hickory savannah that has about a 30 percent canopy. Scattered yaupon are associated with the trees. The composition by weight is 75 percent grasses, 20 percent woody plants, and 5 percent forbs. This range site is droughty.

About 35 percent of the composition is little bluestem, and 15 percent of the total composition is slender indiangrass, purpletop, and longleaf uniola. Other grasses are purple lovegrass, red lovegrass, and woolysheath threeawn. Woody plants include bluejack oak, post oak, blackjack oak, hickory, and an understory of yaupon, hawthorn, greenbrier, and berry vines. The forbs are lespedeza, tickclover, snoutbean, and partridge pea.

Because of the low fertility and droughty condition of this site, little bluestem, slender indiangrass, switchgrass, and indiangrass decrease very rapidly under grazing pressure. They are replaced by low panicums, low paspalums, purple lovegrass, red lovegrass, and woolysheath threeawn. As retrogression continues, yaupon increases to form a 60 to 80 percent canopy. Continued overgrazing causes the area beneath the tree canopy to deteriorate to bare ground or a sparse cover of common selfheal, bracted breweria, bullnettle, curly threeawn, snakecotton, yankeeweed, tumble lovegrass, purple sandgrass, red sprangletop, sandbur, and pricklypear.

Woodland Management and Productivity

Ed Holcombe, state forester, John Ross, forester, and John Copeland, area plant scientist, Soil Conservation Service, helped prepare this section.

Although woodland is not a predominant land use in Leon County, many soils have a potential for commercial timber production. Soils on the bottom lands of rivers and other major streams are suited to hardwood growth and management, while those on uplands are capable of medium to high production of pines.

Most of the commercial woodland is in the eastern part of the county. Moisture regimes may be a reason for this. "Yard plantings" in the western part, however, indicate a capability of timber growth all over the county.

Present acreage of pine, the consistently economic wood crop, is relatively small; however, indications are that the acreage is increasing. Pine reproduction encroaches on any land where woody growth is removed. The soils in Leon County have the capability of increased production of commercial woodland.

The "Post Oak Belt," which is in the western part of Leon County, is used mostly for livestock operations. The predominant tree, post oak, is capable of growing to commercial size for railroad ties or other products. The soils in this area, however, have a capability of growing pines or other more valuable trees.

Table 8 can be used by landowners or operators in planning the use of soils for wood crops. Only those soils that have grown suitable wood crops are listed. Similar soils in the western part of the county may have similar capabilities of growing such wood crops. Observance of yard plantings can give indications of potentials in this part of the county. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

Soils vary in their ability to produce trees. Depth, fertility, texture, and the available water capacity influence tree growth. Position on the landscape and climate determine the kinds of trees that can grow on a site.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special efforts to reforest. In the section "Detailed Soil Map Units," each map unit in the survey area suitable for producing timber presents information about productivity, limitations for harvesting timber, and management concerns for producing timber. The common forest understory plants are also listed. Table 8 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight*, *moderate*, and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

The first tree listed for each soil under the column "Common trees" is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

Table 8 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species based on its site index. The larger the number, the greater the potential productivity.

Loblolly pine is the indicator species for soils that grow pine trees. Soils that are well suited to production of pine (site indices of 86+) have a 9, 10, or 11 as the first part of the ordination symbol. An 8 represents soils that are moderately suited (site indices of 78 to 85), and soils that have 7 or less in the first part of the ordination symbol (site indices of 77 or less) are poorly suited to production of pine trees.

Sweetgum is the usual indicator species for soils that grow hardwood trees only. Sweetgum does not grow on all hardwood sites; therefore, the first species listed under "Common trees" in table 8 is the indicator species for the site.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation for use and management. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the soil. The letter *S* indicates a dry, sandy soil. The letter *F* indicates a soil that has a large amount of coarse fragments in the soil profile. The letter *A* indicates a soil that has no significant restrictions or limitations for forest use and management. If a soil has more than one limitation, the priority is as follows: W, C, S, and F.

The third part of the ordination symbol, a lower case letter, is used in only a few places to separate soils that are in the same group but grow different vegetation.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation activities or harvesting operations expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of *moderate* or *severe* indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning of harvesting and reforestation operations, or use of specialized equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, or susceptibility of the surface layer to compaction. As slope gradient and length increase, it becomes more difficult to use wheeled equipment. On the steeper slopes, tracked equipment must be used. On the steepest slopes, even tracked equipment cannot operate; more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by soil wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are steep enough that wheeled equipment cannot be operated safely across the slope, if soil wetness restricts equipment use from 2 to 4 months per year, if stoniness or sandy texture restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. The rating is *severe* if slopes are steep enough that tracked equipment cannot be operated safely across the slope, if soil wetness restricts equipment use for more than 4 months per year, if stoniness or sandy texture restricts ground-based equipment, or if special equipment is needed to avoid or reduce soil compaction. Ratings of *moderate* or *severe* indicate a need to choose the most suitable equipment and to carefully plan the timing of harvesting and other management operations.

Ratings of *seedling mortality* refer to the probability of death of naturally occurring or properly planted seedlings of good stock in periods of normal rainfall as influenced by kinds of soil or topographic features. *Seedling mortality* is caused primarily by too much water or too little water. The factors used in rating a soil for seedling mortality are texture of the surface layer, depth and duration of the water table, rock fragments in the surface layer, and rooting depth. Mortality generally is greatest on soils that have a sandy or clayey surface layer. The risk is *slight* if, after site preparation, expected mortality is less than 25 percent; *moderate* if expected mortality is between 25 and 50 percent; and *severe* if expected mortality exceeds 50 percent. Ratings of *moderate* or *severe* indicate that it may be necessary to increase the planting rates, to use containerized or larger than usual planting stock, or to make special site preparations, such as bedding, furrowing, or installing surface drainage. Reinforcement planting is often needed if the risk is *moderate* or *severe*.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. *Plant competition* becomes more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants reduces adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants reduces natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A *moderate* or *severe* rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers must plan site preparation measures to ensure reforestation without delays.

The potential productivity of *common trees* on a soil is expressed as a *site index*. Common trees are listed in the order of their observed general occurrence. Generally, only two or three tree species dominate.

The *site index* is determined by taking height measurements and determining the age of selected dominant and codominant trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years, 30 years for cottonwood and 50 years for all other species. This index applies to fully stocked, even-aged, unmanaged stands. The procedure and technique for determining site index are given in the site index tables used for the

Leon County soil survey *(4, 5, 6, 7, 8)*.

The *productivity class* represents an expected average yearly growth by the most important trees, expressed in board feet (Doyle Rule) per acre. These annual growth figures apply to fully stocked, natural stands over a 50 year period. These stands do not have a history of any intermediate cutting management; therefore, applying sound forestry management practices, such as thinning, can significantly increase the listed yields.

Trees to plant are those that are used for reforestation or, if suitable conditions exist, natural regeneration. They are suited to the soils and will produce a commercial wood crop. Desired product, topographic position (such as a low, wet area), and personal preference are three factors of many that can influence the choice of trees to use for reforestation.

Woodland Understory Vegetation

Rhett H. Johnson, state range conservationist, Ed Hulcombe, state forester, John C. Copeland, area plant scientist, and Linda Campbell-Kissock, range conservationist, Soil Conservation Service, helped prepare this section.

When Leon County was first settled, the woodlands were an open canopy of post oak, blackjack oak, red oak, water oak, green ash, and hickory with scattered stands of shortleaf and loblolly pines. The understory was little bluestem, indiangrass, big bluestem, switchgrass, purpletop, longleaf uniola, American beautyberry, yaupon, dogwood, brackenfern, and tickclover. Natural wildfires were a part of the woodland ecosystem and tended to keep the canopy and mid canopy more open than they are today. Suppression of fire, concentrated year long overgrazing, and regeneration of pine have caused a closure of the oak and pine canopy. This closure has suppressed the tall, sun-loving grasses and enhanced shade-tolerant plants, such as longleaf uniola. Forage production is significantly reduced.

To manage woodlands for timber and understory forage production, two practices are essential. First, the overstory and midstory canopy must be reduced through harvesting trees, deadening undesirable species, and prescribed burning. Sunlight can then penetrate to the woodland floor, which perpetuates the growth of natural tall grasses under the overstory. Second, good grazing management is essential to allow these productive plants to reestablish and produce to their potential. These practices must be applied simultaneously to insure maximum forage production.

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

Table 9 gives the plant communities and total production of understory vegetation that exist under the 0 to 20 percent and 36 to 55 percent canopies if good grazing management is used. The total production of the understory vegetation includes the herbaceous plants and the leaves, twigs, and fruit of woody plants up to a height of 4.5 feet. Total production is expressed in pounds per acre of air-dry vegetation in normal years. Composition of the plant community is expressed as a percentage composition by air-dry weight of each kind of plant. Canopies of more than 55 percent support predominantly shade-tolerant and cool-season plants and cover large areas of bare ground. Production of understory vegetation normally is 100 to 500 pounds on these closed canopies.

Gardening, Orchards, and Landscaping

Steve Huebner, Leon County extension agent, helped prepare this section.

Three out of every five families in Leon County have some type of home vegetable garden or orchard. The majority of homeowners landscape their lawns and outdoor living areas.

Commercial vegetable and orchard production contributed about 800,000 dollars to the local agricultural economy in 1983 *(12)*. Small acreages of turnip and mustard greens, squash, okra, peas, corn, cucumbers, and watermelons are harvested and sold to area grocery outlets or marketed in Houston or other distant produce centers.

Regardless of the purpose of horticultural production in Leon County, the selection of a suitable soil site is essential for success. Although many homeowners are limited to the selection of a soil site, an area exposed to full sunlight and that has a deep root zone, a loamy texture, a balanced supply of plant nutrients, a near neutral pH, plenty of organic matter, adequate available water capacity, good drainage, and good tilth is considered ideal. By modifying certain cultural practices and crop selections, almost any soil site can become a highly productive garden, orchard, or horticultural enterprise.

Many home sites do not have deep, well drained, fertile soils that are ideal for vegetable and landscaping purposes. These soils must be altered to provide the right combination of characteristics for optimum plant growth. A soil test is required to determine the nutrient level and soil pH. Most soils in Leon County are medium acid or slightly acid. The degree of alkalinity or acidity (pH) is important in the suitability of soils for particular plants. For example, roses, most annual flowers, most vegetables, and most grasses generally do well in soils that are neutral or only slightly acid. Vegetables, grasses, and some landscape plants benefit from the addition of lime. Some plants, such as azaleas and strawberries, grow better on soils that are medium acid or strongly acid, and the addition of lime should be limited.

In general, a plant suited to an area grows well only in a soil that has properties that favor that plant. For example, if a plant is grown in a soil that has poor drainage, tile drains or raised beds must be provided. For garden and landscape plants, sandy soils, such as the Padina, Pickton, Silstid, Silawa, Flo, Arenosa, and Tonkawa soils, would benefit from the addition of 3 to 6 inches of organic matter. Adding organic matter to sandy soils increases water and nutrient retention, lowers the soil temperature during the summer, and improves soil tilth. If the soil has a clay or clay loam surface layer, such as in the Dimebox, Benchley, Wilson, Crockett, Ashford, and Lexton soils, 2 or 3 inches of organic matter and 1 or 2 inches of sand can improve drainage and aeration. Additions of organic matter and sand and installation of a drainage system are feasible in small areas. In large scale horticultural crop production, however, the cost would be prohibitive and careful soil site selection that meets nearly all of the requirements for favorable crop growth would be required.

Fruit and pecan orchards are a long-term venture and require very thorough planning and judgment for site selection. Selecting a poorly suited site would be a costly mistake.

Fruit trees grow well on a wide range of soils that have good internal drainage (fig. 16). Internal soil drainage is probably the most important requirement for successful fruit tree production. A sandy loam topsoil 1 to 2 feet thick that is underlain by a red, brown, or yellowish permeable subsoil is ideal for peaches, pears, apples, and plums. In Leon County, the Gasil, Oakwood, Attoyac, Elrose, Flynn, Margie, Rader, Silawa, and Trawick soils are well suited to fruit tree orchards.

Pecan orchards can be grown on bottom lands or uplands on sites that have soils similar to those used for fruit tree production. On bottom lands, the soils should be deep, permeable, and well drained and have no compacted layers. They should be inherently rich in both major and minor nutrients and have the ability to absorb and hold large quantities of water from overflows, rain, or irrigation. The Hatliff, Nahatche, Gowker, and Nugent soils are suitable; however, production is limited because the high water table is near the surface for part of the year. Many soils on bottom lands, such as Kaufman and Gladewater soils, are clayey and tend to become waterlogged during the winter and spring and after heavy rains. These soils would give limited production of pecans. Soils on the uplands are highly varied, and site selection must be done with care. These soils should have a deep, permeable, sandy loam or loam topsoil about 3 feet thick. Clay loam or clay topsoil limits production. Soils that have sand or loamy sand topsoil have good movement of water and air but have poor water retention ability. For good moisture storage, the subsoil should be loam, clay loam, or sandy clay loam, but it should not be saturated for long periods. Soils on the uplands generally are not as fertile as those on the bottom lands and on terraces, and nitrogen and foliar zinc are needed. Irrigation is needed in some years. Attoyac, Bienville, Chazos, Elrose, Flynn, Gasil, Oakwood, Rader, and Silawa soils are on uplands and are well suited to pecan production. Except for the deep, sandy soils that are too droughty, most other soils on uplands would give limited production of pecans. Ponded soils or seeps should also be avoided. To determine suitable soil characteristics needed for pecan tree production, refer to the description of soils in the section "Detailed Soil Map Units."

Vegetable production, landscaping, and orchard development are important horticultural concerns in Leon County. A wide variety of soils and adequate water supplies are available to expand production of vegetables, fruits, and pecans, either on a home or commercial basis. Success is achieved, however, only through proper management, such as variety selection; weed, insect, and disease control; pruning; and timely watering.

For more detailed guidelines on gardening, landscaping, and orchard production, consult the local office of the County Extension Agent or the Soil Conservation Service.

Figure 16.—Many of the soils in Leon County are suited to the production of peaches, plums, pears, and other fruits. This orchard is on Pickton loamy fine sand, 1 to 8 percent slopes.

Recreation

Gordon J. Kelley, soil conservationist, Soil Conservation Service, helped prepare this section.

Leon County with its location, climate, topography, highways, and natural resources has a high potential for numerous outdoor recreational activities. The county is a little more than a 2-hour drive from Dallas or Houston, which provides close proximity to population centers for activities requiring large numbers of people. Pleasant daytime temperatures and cool nights contribute to summer activity. The mean temperature and rainfall of the county are favorable when compared to the two major metropolitan areas. Pleasant temperatures, relatively open conditions, and little snow are typical characteristics of the winter. Several cold fronts that are severe enough to restrict outside recreational activity for a few days move through the region in the winter. Much of the terrain has soils, existing vegetative patterns, and topographic conditions suitable for recreational activities. Rolling terrain and a variety of vegetative patterns contribute to the visual quality. Major highways cross the county; the most notable is Interstate Highway 45 connecting Houston and Dallas.

In table 10, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes, stones, or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Frank Sprague, biologist, Larry Starnes, district conservationist, John C. Copeland, area plant scientist, and Linda Campbell-Kissock, range conservationist, Soil Conservation Service, helped prepare this section.

Leon County is a rural environment bordered on the east by the Trinity River and on the west by the Navasota River. The uplands are dominated by post oaks in the western part of the county with increasing inclusions of pine and other hardwoods in the eastern part. Bottom lands are confined to major streams and tributaries. Bottom land hardwoods exist along smaller streams but have been cleared for agricultural use on most of the major flood plains.

Habitat for numerous wildlife species is provided by the mixture of land uses and diversity of vegetative types.

The major game species in Leon County is the white-tailed deer. Other important game species include fox squirrel, quail, and dove. The county is in the central flyway for waterfowl and other migratory birds. Waterfowl are commonly on ponds, streams, and flooded bottom lands during peak migration periods. Important furbearers include raccoon, opossum, skunk, and beaver. Coyotes are numerous in the county. Cottontail and swamp rabbits are common and provide sport hunting. The American alligator is the only endangered species whose range extends into Leon County, although several species of birds including the American bald eagle migrate through the county.

White-tailed deer numbers have increased significantly since the reintroduction of deer in the 1940's. Populations have reached and exceeded the carrying capacity in some parts of the county in recent years. Hunting leases are numerous, and hunting is heavy throughout the county. Heavy hunting pressure and restricted doe harvest have resulted in distorted buck-doe ratios. Bucks in younger age classes constitute the vast majority of the harvest since few survive to reach maturity, which occurs at about 4 years of age. Leasing of hunting rights constitutes a major source of income for many landowners and often exceeds the return from livestock grazing.

Numerous small land holdings make management of deer difficult and contribute to increased hunting pressure. Production of high quality forbs and browse is severely limited by the dense tree overstory on most upland habitat. Critical stress periods for deer are midsummer and late winter in years of below normal or of abnormal rainfall. Deer habitat in Leon County can be improved by selective thinning, prescribed burning, and planting of food plots.

Cooperative efforts of individual landowners to improve habitat and properly harvest deer herds can improve the quality of hunting in the county. Where small units exist, it is impractical for one landowner to initiate a successful management plan without the cooperation of adjoining landowners.

Quail populations in Leon County have declined with the decrease in small subsistence farming that has occurred over the past 50 years. Farming produced seeds of domestic crops and weeds that provided a food supply for quail. Woodland tracts provide little or no food supply for quail, and most openland is currently in grass and pasture, which provides only limited food. The potential for quail habitat improvement is high, and quail populations can be increased by such practices as disking to promote weed growth and annual planting of seed producing crops.

Squirrels are numerous along streams and bottom lands where oak and other mast-producing species grow. Landowners who wish to manage for squirrels must be very selective in any clearing of timber to assure that high quality hardwoods are retained.

Stocking of turkeys is a future possibility where habitat needs can be met and landowner interest is adequate. The eastern wild turkey has been successfully reintroduced into east Texas and may be adaptable to the eastern part of Leon County.

The Trinity River, Navasota River, and numerous lakes and ponds provide fishing. White bass, crappie, and catfish in the Trinity River provide sport fishing. Black bass, channel catfish, and numerous species of sunfish are the major species in ponds and lakes. Interest in stocking and management of the estimated 4,000 farm ponds in Leon County is high.

Conservation practices applied by landowners can be modified or adapted to maintain or enhance wildlife habitat on most farms and ranches. Grazing management of domestic livestock is particularly important where deer and livestock occupy the same range. Proper stocking and adequate rest periods to avoid competition for key plants is essential. Pasture planting and management programs that use species of value to wildlife as well as livestock and that avoid elimination of valuable wildlife plants can be implemented. Brush management and clearing practices should be planned to retain adequate cover for wildlife. Prescribed burning can improve the quantity and quality of forage for livestock as well as wildlife. Poorly planned land clearing or other practices detrimental to wildlife habitat can reduce land values.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Farming is limited in Leon County and consists of grain sorghum, oats, wheat, ryegrass, barley, millet, cowpeas, soybeans, and sunflowers. Several thousand acres of small grains are planted annually to provide quality forage for deer late in winter. Some grain sorghum and millet is planted to feed dove, quail, ducks, and geese.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bermudagrass, bahiagrass, fescue, lovegrass, kleingrass, switchgrass, vetch, singletary peas, and clover. Perennial warm-season grasses, such as coastal bermudagrass, have little value for wildlife. Because of the hard seed produced, bahiagrass has some value as a food source for game birds. Clover, particularly arrowleaf, provides excellent grazing for deer late in winter and in spring. It can produce large amounts of forage on small acreages. Most soils in Leon County will sustain the production of legumes. Fertile, well drained, clay loam or sandy loam soils are well suited to arrowleaf clover. Crimson clover requires well drained, sandy soils or alkaline clayey soils. Poorly drained, clayey and loamy soils on bottom lands are well suited to white Dutch clover, and subterranean clover grows well on a wide variety of well drained soils except for deep, sandy soils. Because of the low fertility of Leon County soils, legumes are highly desirable in the food chain of wildlife and domestic animals.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Native forbs and legumes are highly nutritious and are preferred by deer. Lespedeza, sedges, St. Andrews cross, tickclover, swamp sunflower, Maximilian sunflower, Engelmann daisy, wildbean, vetch, snoutbean, wildrye, and low panicums are readily eaten by deer. Numerous other forbs are eaten by deer during certain stages of growth or seasons of the year. The herbaceous plants most important to dove and quail produce smooth hard seed. Ragweed, croton, partridge pea, wildbean, sesbania, bristlegrass, panicum, switchgrass, smartweed, sunflower, vetch, bundleflower, and tickclover are the main diet of dove and quail. Forbs grow best in openings and thinned stands of timber. The production and variety of forbs and legumes are greatly reduced under a dense tree canopy. Perennial grass pastures produce a variety of forbs and legumes; some are desirable for wildlife food. Chemicals should be used with caution if wildlife management is an objective. Selective thinning of woodland overstory, prescribed burning in the fall, maintaining openings in wooded areas, and disking along edges of field boundaries, fence rows, wooded areas, firebreaks, and roads are needed to increase the production and variety of herbaceous plants.

Hardwood trees and woody understory plants provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, elm, beech, blackgum, tupelo gum, hackberry, sassafras, persimmon, dogwood, hickory, mulberry, and black cherry. Other trees important to deer are plum, farkleberry, hawthorn, haw, and fringetree. Oak trees are particularly important for squirrel since acorns are the mainstay of their diet. Fruit from pecan, beech, walnut, blackgum, and hickory are also preferred. Most hardwood trees must be at least 25 years old before acorn production begins, so large hardwoods provide the greatest amount and the most stable food supply. These older and larger trees also provide den cavities for squirrel. Wooded areas that have moderate to light woody overstory of oak, hickory, tupelo, and other desirable mast-producing trees provide a good waterfowl habitat when these areas are periodically flooded during fall and winter. These areas, whether produced by natural flooding or manmade impoundments, are particularly attractive to mallards and wood ducks.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and eastern redcedar.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Major browse plants for deer include American beautyberry, yaupon, Alabama supplejack, greenbrier, sumac, virburnum, coral berry, dewberry, blackberry, Carolina jessamine, honeysuckle, and grape. Both the fruit and foliage of most of these plants are eaten. Cattle and deer often compete for desirable browse species during the winter. Proper stocking and periodic rest periods can reduce this competition. Prescribed burning can also be used to reduce canopy, improve the nutritional value of browse, and increase its availability by maintaining woody plants within the reach of deer.

Wetland plants are annual and perennial, wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, reeds, cattails, maidencane, and giant plumegrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water control structures in marshes and streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are waterfowl feeding areas, wildlife watering areas, beaver ponds, and other wildlife ponds. A few shallow water areas, locally termed as marshes, provide feeding areas for ducks and cranes. They provide for little if any nesting areas. The shallow water areas of Leon County are generally covered with only a few inches of water. These will dry up and disappear within a few weeks if adequate rainfall is not received. Water control devices could be installed and shallow water areas developed or enhanced on several sites in Leon County.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail, coyote, and fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, fox, raccoon, deer, and coyote.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, alligator, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include deer, quail, meadowlark, and cottontail.

Surface Mine Reclamation

Norman Bade, conservation agronomist, Soil Conservation Service, prepared this section.

Lignite deposits underlie many of the soils in Leon County. Strip mining these near surface lignite deposits results in large acreages of disturbed lands. Most of the strip-mining areas are in the northwest part of the county. Surface mining for lignite is accomplished by clearing existing vegetation, removing all overburden using large draglines, mining the lignite, and replacing the overburden.

The reclamation process involves both soil reconstruction and revegetation. After mining the lignite and replacing the overburden, the spoil is graded to its planned contour and revegetated to the planned postmine land use. Following reconstruction, land can be used as cropland, pasture, rangeland, wildlife habitat, recreation areas, woodland, orchard, or residential or industrial development. The selected postmine land use determines the plant materials and reclamation procedures.

Successful reclamation of strip-mined soils depends on an understanding of the chemical, physical, and biological properties of soils. The soil properties generally are altered as the soil is disturbed. This can affect the alternative land use and productivity.

The objectives of reclamation are to restore the soil to a condition capable of supporting its intended use, to prevent permanent damage, and to control erosion and sedimentation.

The method of reconstruction after mining is important to the success of reclamation efforts. Methods of removal of overburden and reconstruction of the soil should provide for the final surface placement of soil material that is the best available for plant growth and productivity. Surface mining and reconstruction alters many of the soil properties and results in an initial increase in erosion potential, decrease in fertility, and in a strong tendency to crust. Because unoxidized geologic material from greater depths generally contains acid-forming pyrites, testing of chemical properties of the soil is needed.

Because of the disturbed nature of the soils following mining and reconstruction, the reclamation process generally requires a higher application of soil amendments, plant material seed and sprigs, and subsequent management.

The revegetation of mined lands requires a good seedbed, adequate amounts of fertilizer, and selection of plant species that control erosion and provide for the land's intended use. Plants commonly used for cover and forage include Coastal bermudagrass, common bermudagrass, Selection 75 kleingrass, Pensacola bahiagrass, and King Ranch bluestem. Other important species include Haskell sideoats grama, T-587 old world bluestem, Alamo switchgrass, and Lometa indiangrass.

The addition of legumes, such as Yuchii arrowleaf clover, crimson clover, subterranean clover, and hairy vetch, increases forage capabilities and provides needed nitrogen for other species. Other forbs and legumes, such as Sabine Illinois bundleflower, singletary pea, Engelmann daisy, and Aztec Maximilian sunflower, provide forage diversity and increase wildlife habitat. The addition of trees, shrubs, and vines also aid in enhancing wildlife habitat.

Current Texas regulations require all lignite mined soils to be reclaimed according to a prepared and approved reclamation plan including vegetation of the area. The applicant is also responsible for the success of the vegetation following its establishment for a designated period of time. National and state regulations need to be considered in the planning, site selection and design, and application of any reclamation procedures.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet, and because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations must be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, depth to a water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant-available nutrients as it decomposes.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; and susceptibility to flooding. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 22.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20, or higher, for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 22.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area, or from nearby areas, and on field examination.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They influence the soil's adsorption of cations, moisture retention, shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of movement of water through the soil when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage in each major soil layer is stated in inches of water per inch of soil. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion. Losses are expressed in tons per acre per year. These estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflowing streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall is not considered flooding. Standing water in swamps and marshes or in a closed depression is considered ponding.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as *none*, *rare*, *occasional*, or *frequent*. *None* means that flooding is not probable. *Rare* means that flooding is unlikely but possible under unusual weather conditions (there is a near 0 to 5 percent chance of flooding in any year). *Occasional* means that flooding occurs infrequently under normal weather conditions (there is a 5 to 50 percent chance of flooding in any year). *Frequent* means that flooding occurs often under normal weather conditions (there is more than a 50 percent chance of flooding in any year). Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that floods are most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely, thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or *apparent*; and the months of the year that the water table commonly is highest. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

The two numbers in the "High water table—Depth" column indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. In some areas of Leon County, steel pipe risers in ponds and steel culverts in road drainage ditches have failed because of corrosion. Special site examination and design may be needed if the combination of factors creates a severely corrosive environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and the amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 19, the results of chemical analysis in table 20, and the results of clay mineralogy are given in table 21. The data are for soils sampled at carefully selected sites. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska; and by Soil Charateriazation Laboratory, Texas A&M University, College Station, Texas.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters in diameter. Measurements reported as percent or quantity of unit weight were calculated on an oven-dry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (17).

Sand—(0.05-2.0 mm fraction) weight percentages of materials less than 2 mm (3A1).

Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all materials less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of materials less than 2 mm (3A1).

Water retained—pressure extraction, percentage of oven-dry weight of less than 2 mm material; 1/3 or 1/10 (3/10) bar (4B1), 15 bars (4B2).

Moist bulk density—of less than 2 mm material, saran-coated clods (4A1).

Linear extensibility—change in clod dimension based on less than 2 mm material (4D).

Organic carbon—dichromate, ferric sulfate titration (6A1a).

Extractable cations—ammonium acetate pH 7.0, uncorrected; calcium (6N2), magnesium (6O2), sodium (6P2), potassium (6Q2).

Cation-exchange capacity—ammonium acetate, pH 7.0 (5A1a).

Base saturation—sum of cations, TEA, pH 8.2 (5C3).

Reaction (pH)—1:1 water dilution (8C1a).

Aluminum saturation (5G1).

Exchangeable sodium percentage (5D2).

Clay mineralogy (7A2i).

Engineering Index Test Data

Table 22 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil Series and Their Morphology."

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Specific gravity (particle density)—T 100 (AASHTO), D 653 (ASTM); and Shrinkage—T 92 (AASHTO), D 427 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(16)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or on laboratory measurements. Table 23 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Ultisol.

SUBORDER. Each order is divided into suborders, primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udult (*Ud*, meaning moist, plus *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludults (*Hapl*, meaning minimal horizonation, plus *udults*, the suborder of the Ultisols that occurs in moist climates).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Hapludults.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is clayey, mixed, thermic Typic Hapludults.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. There can be some variation in the texture of the surface layer or of the substratum within a series. An example is the Kirvin series, which is a member of the clayey, mixed, thermic family of Typic Hapludults.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (14)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (16)*. Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Arenosa Series

The Arenosa series consists of deep, gently sloping to undulating, somewhat excessively drained soils on uplands. These soils are very rapidly permeable. They formed in deep beds of sand. Slope ranges from 1 to 8 percent. The soils of the Arenosa series are thermic, coated Typic Quartzipsamments.

Typical pedon of Arenosa fine sand, 1 to 8 percent slopes; from Farm Road 39 in Jewett, 1.8 miles west on U.S. Highway 79, 1.2 miles north on Farm Road 1512 to Newby, 4.9 miles west on Farm Road 1469, 0.3 mile southwest on a private road, and 50 feet west, in woodland.

A—0 to 6 inches; yellowish brown (10YR 5/4) fine sand; weak fine granular structure and single grained; soft, loose; common fine roots; slightly acid; gradual smooth boundary.

C1—6 to 52 inches; pink (7.5YR 7/4) fine sand; single grained; loose; few fine roots in upper part; medium acid; diffuse smooth boundary.

C2—52 to 84 inches; very pale brown (10YR 7/3) fine sand; single grained; loose; medium acid.

The solum ranges from 80 to more than 100 inches in thickness.

The A horizon is dark yellowish brown, yellowish brown, or brownish yellow. Reaction is medium acid or slightly acid. The A horizon is 2 to 8 inches thick.

The C horizon is very pale brown or pink. The texture is fine sand or sand. Reaction is medium acid or slightly acid.

Ashford Series

The Ashford series consists of deep, nearly level, poorly drained soils on ancient terraces. These soils are very slowly permeable. They formed in clayey alluvium. Slope is 0 to 1 percent. The soils of the Ashford series are very-fine, montmorillonitic, thermic Vertic Ochraqualfs.

Typical pedon of Ashford clay loam, 0 to 1 percent slopes; from Texas Highway 7 at Malvern, 10.5 miles north-west on Farm Road 542, and 300 feet east, in pasture.

A—0 to 5 inches; dark grayish brown (10YR 4/2) clay loam; common medium faint grayish brown (10YR 5/2) and brown (10YR 5/3) mottles; moderate medium angular to subangular blocky structure; very hard, firm; common fine roots; strongly acid; clear smooth boundary.

Btg1—5 to 24 inches; light brownish gray (10YR 6/2) clay; common fine distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; few pressure faces and clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btg2—24 to 42 inches; light brownish gray (10YR 6/2) clay; common fine distinct brownish yellow (10YR 6/6) mottles and common medium faint light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few pressure faces and clay films on faces of peds; very strongly acid; gradual smooth boundary.

Btg3—42 to 80 inches; light brownish gray (10YR 6/2) clay; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; extremely hard, very firm, sticky and plastic; few pressure faces and clay films on faces of peds; strongly acid.

The solum is more than 60 inches thick. Small rounded black concretions range from none to few. During dry periods, cracks 0.5 to 1 inch wide extend from the surface to a depth of 20 to 30 inches.

The A horizon is very dark gray, dark grayish brown, very dark grayish brown, or grayish brown. Some pedons have brown or yellowish brown mottles. Reaction is strongly acid or medium acid. The A horizon is 2 to 9 inches thick.

The Btg horizon is dark gray, gray, grayish brown, light brownish gray, or olive gray. Few to many yellowish brown, yellowish red, reddish yellow, or brown mottles are in most pedons. The clay content of the upper 20 inches of the Btg horizon is 60 to 75 percent. Reaction ranges from very strongly acid to medium acid in the upper part of this horizon and from strongly acid to mildly alkaline in the lower part.

Attoyac Series

The Attoyac series consists of deep, nearly level to strongly sloping, well drained soils on stream terraces (fig. 17). These soils are moderately permeable. They formed in loamy alluvial deposits. Slope ranges from 0 to 12 percent. The soils of the Attoyac series are fine-loamy, siliceous, thermic Typic Paleudalfs.

The Attoyac soil in map unit AtD decreases in clay content by more than 20 percent of the maximum within a depth of 60 inches. This soil is considered a taxadjunct in this respect, but use and management are similar to other Attoyac soils.

Typical pedon of Attoyac fine sandy loam, 0 to 3 percent slopes, 7 miles northwest of Texas Highway 7 in Malvern on Farm Road 542, 2.7 miles north on Farm Road 542 from its intersection with Farm Road 3178, 0.4 mile east on a county road, 0.2 mile north on a county road, and 125 feet west, in pasture.

Ap—0 to 12 inches; yellowish brown (10YR 5/4) fine sandy loam; weak fine granular structure; very friable, soft; common fine roots; medium acid; clear smooth boundary.

Bt1—12 to 38 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; hard, friable; common fine roots and pores; common thin clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—38 to 52 inches; red (2.5YR 5/8) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, friable; common fine roots and pores; thin clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—52 to 72 inches; red (2.5YR 5/8) sandy clay loam; small pockets of light yellowish brown (10YR 6/4) uncoated sand; weak medium subangular blocky structure; hard, friable; fine roots and pores; few thin patchy clay films on faces of peds; strongly acid.

The solum ranges from 60 to more than 100 inches in thickness.

The A horizon is yellowish brown, dark brown, and brown. Reaction is medium acid or slightly acid. The A horizon is 6 to 18 inches thick.

The upper part of the Bt horizon is red and yellowish red. The texture is fine sandy loam, sandy clay loam, or loam. Clay content is 18 to 32 percent. Reaction is strongly acid or medium acid.

The lower part of the Bt horizon is red, yellowish red, or strong brown. A few brown and yellowish mottles are in some pedons. The texture is sandy clay loam, loam, or fine sandy loam. Reaction is strongly acid or medium acid. Few skeletans and small pockets of uncoated sand are in some pedons, but they make up less than 5 percent of the horizon.

Axtell Series

The Axtell series consists of deep, nearly level to strongly sloping, moderately well drained soils on old terraces. These soils are very slowly permeable. They formed in acid to alkaline clayey sediments. Slope ranges from 1 to 12 percent. The soils of the Axtell series are fine, montmorillonitic, thermic Udertic Paleustalfs.

Typical pedon of Axtell fine sandy loam, 1 to 5 percent slopes; from Texas Highway 7 in Marquez, 7 miles north on Farm Road 1146 to Farm Road 1469, 1.5 miles west on a county road, 1 mile south on park road, and 150 feet northeast, in woodland.

A—0 to 4 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; slightly hard, very friable; strongly acid; clear smooth boundary.

E—4 to 8 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure; hard, friable; strongly acid; abrupt wavy boundary.

Bt1—8 to 18 inches; yellowish red (5YR 5/8) clay; common medium distinct red (2.5YR 4/6) mottles and few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few shiny pressure faces; thin clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—18 to 30 inches; yellowish brown (10YR 5/6) clay; common medium distinct red (2.5YR 4/6) and yellowish red (5YR 4/8) mottles and few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few medium shiny pressure faces; thin clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3—30 to 35 inches; brownish yellow (10YR 6/6) clay; few fine distinct light brownish gray (10YR 6/2) mottles and few fine prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; patchy clay films on faces of peds; extremely hard, very firm; medium acid; gradual wavy boundary.

BC1—35 to 41 inches; light yellowish brown (2.5Y 6/4) clay; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; slightly acid; gradual wavy boundary.

BC2—41 to 80 inches; light yellowish brown (2.5Y 6/4) clay; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; extremely hard, very firm; mildly alkaline.

The solum is 60 to more than 80 inches in thickness. The A horizon is dark grayish brown, grayish brown, or brown. The E horizon is pale brown, light yellowish brown, or very pale brown. Reaction is strongly acid or medium acid in the A and E horizons. Combined thickness of the A and E horizons is less than 10 inches in more than 50 percent of the pedon.

The Bt1 horizon is red, reddish brown, or yellowish red. Mottles of 2 or lower chroma are in the Bt1 horizon of most pedons. The remaining pedons are mottled in shades of red, brown, yellow, gray, and olive. The texture is clay. The average clay content in the upper 20 inches of the argillic horizon is 40 to 55 percent. Reaction is very strongly acid in the upper part of the Bt horizon to medium acid in the lower part.

The BC horizon is clay, clay loam, or sandy clay loam. Calcium carbonate concretions or calcium sulfate crystals are in some pedons. Reaction is medium acid to moderately alkaline.

Benchley Series

The Benchley series consists of deep, gently sloping, moderately well drained soils on uplands. These soils are slowly permeable. They formed in clayey marine sediment. Slope ranges from 1 to 8 percent. The soils of the Benchley series are fine, montmorillonitic, thermic Vertic Argiustolls.

Typical pedon of Benchley clay loam, 1 to 5 percent slopes; from Texas Highway 7 in Centerville, 9.7 miles southeast on Farm Road 1119, 4.3 miles east and north on Farm Road 811, and 350 feet east, in native pasture.

A—0 to 13 inches; very dark gray (10YR 3/1) clay loam; moderate medium granular to subangular blocky structure; hard, friable; about 5 percent, by volume, rounded ironstone pebbles up to 0.25 inch in diameter; many fine roots; common fine pores; slightly acid; clear wavy boundary.

Bt1—13 to 18 inches; very dark gray (10YR 3/1) clay; few fine distinct yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, firm, plastic; common clay films on faces of peds; about 5 percent, by volume, rounded ironstone pebbles up to 0.25 inch in diameter; common fine roots; common fine pores; medium acid; gradual wavy boundary.

Bt2—18 to 51 inches; red (2.5YR 4/8) clay; common medium prominent light olive brown (2.5Y 5/4) mottles and few fine prominent grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; very hard, firm, plastic; common clay films on faces of peds; about 2 percent, by volume, rounded ironstone pebbles up to 0.25 inch in diameter; few small slickensides; few fine roots; few clay films on faces of peds; medium acid; gradual wavy boundary.

BC—51 to 60 inches; light olive brown (2.5Y 5/4) clay; common fine faint gray mottles and few fine prominent yellowish red (10YR 4/6) mottles; weak medium angular blocky structure; extremely hard, very firm, plastic; few small slickensides; slightly acid; gradual wavy boundary.

C—60 to 80 inches; strong brown (7.5YR 5/6) stratified shale and weakly cemented sandstone; massive; very hard, firm; slightly acid.

The solum ranges from 50 to more than 80 inches in thickness. Ironstone pebbles make up to 5 percent, by volume, of the upper part of the solum in some pedons. During the summer of most years, this soil has cracks 0.5 inch or more wide that extend to a depth of more than 20 inches and are more than 20 inches in length on the surface. This soil has a potential linear extensibility of more than 2.5 inches and a COLE of 0.07 or more in some horizons. Average clay content of the upper 20 inches of the argillic horizon is 40 to 55 percent.

The A horizon is black, very dark gray, very dark grayish brown, or dark brown. Reaction is medium acid to neutral. The A horizon is 10 to 18 inches thick.

The Bt1 horizon is dark brown, black, very dark gray, very dark grayish brown, or dark grayish brown. Mottles range from none to common and are in shades of brown, gray, or red. The texture is clay loam or clay. Reaction is medium acid to neutral. Intersecting slickensides range from none to few.

The Bt2 horizon is red, reddish brown, or yellowish red. Mottles in shades of olive, brown, gray, or yellow range from few to many. The texture is clay. Reaction is strongly acid to neutral. Intersecting slickensides range from few to common.

The BC horizon is mottled in shades of olive, gray, brown, yellow, or red. The texture is clay. Reaction is strongly acid to moderately alkaline. Calcium sulfate crystals and calcium carbonate concretions range from none to common.

The C horizon is mostly stratified shale and weakly cemented sandstone in shades of yellow, brown, gray, or olive. Reaction is strongly acid to moderately alkaline.

Bienville Series

The Bienville series consists of deep, nearly level to gently sloping, somewhat excessively drained soils on stream terraces (fig. 18). These soils are moderately rapidly permeable. They formed in sandy alluvium. Slope ranges from 0 to 3 percent. The soils of the Bienville series are sandy, siliceous, thermic Psammentic Paleudalfs.

The Bienville soils in this survey area are very similar to the Bienville series, however, they receive less precipitation than typical for the series. These soils are considered taxadjuncts in this respect, but use and behavior are similar to other Bienville soils.

Typical pedon of Bienville loamy fine sand, 0 to 3 percent slopes, from Texas Highway 7 in Centerville, 8.6 miles southeast on Farm Road 1119, 1.2 miles east on Farm Road 811, 3 miles southeast on a county road, 3,000 feet south of a wire gate, in pasture.

A—0 to 12 inches, dark brown (10YR 4/3) loamy fine sand; weak fine granular structure; loose, very friable; many fine roots; medium acid; clear smooth boundary.

E—12 to 16 inches, dark brown (7.5YR 4/4) loamy fine sand; weak fine granular structure; soft, very friable; many fine roots; medium acid; clear smooth boundary.

Bt/E1—16 to 48 inches; yellowish red (5YR 4/6) loamy fine sand (Bt); common coarse distinct brown (7.5YR 5/4) spots and streaks of uncoated sand grains (E); weak medium subangular blocky structure; slightly hard, friable; common fine roots; medium acid; gradual wavy boundary.

Bt/E2—48 to 80 inches; strong brown (7.5YR 5/6) loamy fine sand (Bt); common coarse distinct reddish yellow (7.5YR 6/6) spots and streaks of uncoated sand grains (E); weak medium subangular blocky structure; slightly hard, friable; few fine roots; medium acid.

The solum is 60 to more than 80 inches in thickness.

The A horizon is brown, dark brown, dark yellowish brown, or yellowish brown. The reaction is strongly acid to slightly acid.

The E horizon is brown, dark brown, yellowish brown, or light yellowish brown. The reaction is very strongly acid to slightly acid. Combined thickness of the A and E horizons is 15 to 30 inches.

The Bt/E horizon is yellowish red, strong brown, brown, or yellowish brown. Bodies of uncoated sand grains, or E material, have similar colors and also colors slightly higher in value. The E material makes up from 5 to 35 percent of the horizon. The texture of the Bt/E horizon is mainly loamy fine sand but ranges to fine sandy loam in some lamellae. Reaction is strongly acid or medium acid.

Some pedons are underlain with fine sand.

Bub Series

The Bub series consists of shallow, strongly sloping to moderately steep, well drained, loamy soils on uplands. These soils are moderately slowly permeable. They formed in marine sediment high in glauconite. Slope ranges from 8 to 20 percent. The soils of the Bub series are clayey, mixed, thermic, shallow Typic Hapludalfs.

Typical pedon of Bub gravelly clay loam, in an area of Trawick-Bub complex, 8 to 20 percent slopes; from Texas Highway 75 in Centerville, 6.5 miles east on Texas Highway 7, 1.6 miles northwest on a county road to the Pleasant Springs community, 0.3 mile west on a private road, 0.2 mile north on a private road, and 1,200 feet northwest, in a pasture on a steep side slope.

A—0 to 3 inches; dark reddish brown (2.5YR 3/4) gravelly clay loam; moderate fine granular structure; hard, friable; few fine roots; about 20 percent, by volume, fine and medium ironstone fragments and gravel; slightly acid; clear smooth boundary.

Bt1—3 to 13 inches; red (2.5YR 5/6) clay; moderate medium subangular blocky structure; very hard, firm; few fine roots; clay films on surfaces of peds; very strongly acid; gradual wavy boundary.

BC—13 to 18 inches; red (2.5YR 5/6) clay; common medium distinct olive gray (5Y 4/2) and few fine faint yellow masses of weathered glauconitic material; weak medium subangular blocky structure; hard, firm; very strongly acid; clear wavy boundary.

Cr—18 to 80 inches; interbedded layers of dark reddish brown (2.5YR 3/4) ironstone and yellowish brown (10YR 5/8) weathered glauconitic material; massive; medium acid.

The solum is 12 to 20 inches thick.

The A horizon is dark reddish brown or dark brown. Content of ironstone fragments ranges from 15 to 35 percent. Reaction is medium acid or slightly acid. The A horizon is 2 to 6 inches thick.

The Bt horizon is red, dark red, reddish brown, or yellowish red. Clay content of the Bt horizon is 40 to 55 percent. Reaction is very strongly acid to slightly acid.

The BC horizon is red, yellowish red, or strong brown. The texture is clay, clay loam, or sandy clay loam. Masses of weathered glauconitic material and ironstone fragments range from none to common.

Reaction is very strongly acid to slightly acid.

The Cr horizon is yellowish weathered glauconitic material or glauconitic greensand containing interbedded ironstone. Some pedons contain marine seashells, which give rise to a high pH. Reaction is very strongly acid to mildly alkaline.

Burleson Series

The Burleson series consists of deep, nearly level to gently sloping, moderately well drained soils on ancient stream terraces. These soils are very slowly permeable. They formed in alkaline clayey sediment. Slope ranges from 0 to 3 percent. The soils of the Burleson series are fine, montmorillonitic, thermic Udic Pellusterts.

Typical pedon of Burleson clay, 0 to 1 percent slopes; from U.S. Highway 79 in Oakwood, 0.35 mile south on Farm Road 542, 1 mile east on a county road, and 75 feet south, in pasture.

A—0 to 19 inches; very dark gray (10YR 3/1) clay; strong medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; shiny pressure faces on peds; slightly acid; diffuse wavy boundary.

Bw1—19 to 48 inches; gray (10YR 5/1) clay; common medium distinct yellowish brown (10YR 5/4) mottles; strong medium angular blocky structure; distinct intersecting slickensides tilted 30 degrees to 60 degrees from horizontal; extremely hard, very firm, very sticky and very plastic; few very dark brown strongly cemented iron manganese oxide concretions; mildly alkaline; diffuse wavy boundary.

Bw2—48 to 72 inches; grayish brown (2.5Y 5/2) clay; few medium distinct yellowish brown (10YR 5/4) mottles; moderate medium angular blocky structure; few distinct slickensides and parallelepipeds; extremely hard, very firm, very sticky and very plastic; few iron manganese oxide concretions; few weakly cemented calcium carbonate concretions; few soft masses of calcium carbonate; calcareous; moderately alkaline.

The solum ranges from 40 to more than 80 inches in thickness. The control section averages 45 to 60 percent clay. Undisturbed areas have a gilgai microrelief. The distance from the center of the microknoll to the center of the microdepression is 5 to 15 feet. The difference between the high and low points is 3 to 10 inches. The depth to intersecting slickensides is 20 to 30 inches.

The A horizon is 6 inches thick on the microknolls to 48 inches thick on the microdepressions. Thickness of the A horizon averages about 22 inches in most of the pedon. The A horizon is black or very dark gray. Reaction is medium acid to moderately alkaline.

The Bw horizon is dark gray, gray, grayish brown, or pale olive. Mottles increasing in amount with depth range from few to common and are in shades of brown, yellow, or olive. Concretions of calcium carbonate are few to common. Soft masses of calcium carbonate are few to common in the lower part of the horizon. Intersecting slickensides are common or many and are a few inches to a few feet across. Reaction is mildly alkaline or moderately alkaline, and the soil is calcareous or noncalcareous in the lower part.

Chazos Series

The Chazos series consists of deep, gently sloping, moderately well drained soils on stream terraces. These soils are slowly permeable. They formed in interbedded loamy and clayey alluvium. Slope ranges from 1 to 5 percent. The soils of the Chazos series are fine, mixed, thermic Aquic Paleustalfs.

Typical pedon of Chazos loamy fine sand, 1 to 5 percent slopes; from Farm Road 542 in Malvern, 1.2 miles east on Texas Highway 7, 1,000 feet south on a dirt road, and 50 feet west, in cropland.

Ap—0 to 8 inches; dark brown (10YR 4/3) loamy fine sand; weak fine granular structure; slightly hard, very friable; common fine roots; slightly acid; clear smooth boundary.

E—8 to 17 inches; light yellowish brown (10YR 6/4) loamy fine sand; common medium faint yellowish brown (10YR 5/4) mottles; weak fine granular structure; slightly hard, very friable; common fine roots; common fine pores; slightly acid; clear smooth boundary.

Bt1—17 to 40 inches; mottled light brownish gray (10YR 6/2), red (2.5YR 4/6), and reddish yellow (7.5YR 6/6) sandy clay; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; common clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—40 to 48 inches; brownish yellow (10YR 6/6) sandy clay; common medium distinct light brownish gray (10YR 6/2) mottles and few fine distinct red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; few fine pores; common clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—48 to 56 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; hard, firm; few fine pores; few patchy clay films on faces of peds; medium acid; gradual irregular boundary.

B/E—56 to 68 inches; brownish yellow (10YR 6/6) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; about 5 percent, by volume, light gray (10YR 7/2) fine sandy loam (E) mainly on prism faces; weak coarse prismatic structure; slightly hard, firm; medium acid; clear smooth boundary.

2C—68 to 80 inches; light brownish gray (10YR 6/2) clay; many medium distinct brownish yellow (10YR 6/6) mottles; massive; very hard, very firm; common flakes of mica; slightly acid.

The solum ranges from 40 to more than 80 inches in thickness.

The A horizon is brown or dark brown. The E horizon is pale brown, light yellowish brown, or very pale brown. The reaction is medium acid to neutral. Combined thickness of the A and E horizons is 8 to 20 inches.

The Bt horizon is grayish brown, light brownish gray, pale brown, yellowish brown, brownish yellow, and red. It has prominent and distinct mottles in shades of red, yellow, brown, and gray. Some pedons have a mottled matrix in shades of red, yellow, brown, and gray. The texture of the upper part of the Bt horizon is clay or sandy clay that has clay content ranging from 35 to 50 percent in the upper 20 inches of this horizon. The texture includes sandy clay loam below 40 inches. Reaction is medium acid or slightly acid in the Bt1 and Bt2 horizons and medium acid to neutral in the Bt3 horizon.

The B/E horizon is similar to the lower part of the Bt horizon in color, texture, and reaction, but it has few to common clean sand grains or stripped areas on faces of the prisms.

The C horizon ranges from sandy clay loam to clay. Reaction is slightly acid to moderately alkaline. Some pedons do not have a C horizon.

Crockett Series

The Crockett series consists of deep, gently sloping to strongly sloping, moderately well drained soils on uplands (fig. 19). These soils are very slowly permeable. They formed in alkaline shale and clay. Slope ranges from 1 to 10 percent. The soils of the Crockett series are fine, montmorillonitic, thermic Udertic Paleustalfs.

Typical pedon of Crockett fine sandy loam, 1 to 5 percent slopes; from Interstate 45 in Leona, 2.3 miles west on Farm Road 977, 2 miles south on Farm Road 2485 to a county road, 0.9 mile west on the county road, and 1,500 feet northwest of road, in pasture.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; very hard, friable; abundant fine roots; medium acid; abrupt wavy boundary.

Bt1—7 to 18 inches; yellowish brown (10YR 5/8) clay; few fine prominent red (2.5YR 4/8) mottles and few fine distinct olive yellow (2.5Y 6/6) mottles; moderate medium subangular blocky structure; extremely hard, very firm; few fine pores; distinct clay films on faces of peds; vertical cracks partly filled with darker color soil; medium acid; gradual wavy boundary.

Bt2—18 to 26 inches; mottled red (2.5YR 4/6) and olive yellow (2.5Y 6/6) clay; moderate medium subangular blocky structure; extremely hard, very firm; few fine pores; thin clay films on faces of peds; few fine pressure faces; few vertical streaks of dark brown soil; few fine black concretions; neutral; gradual wavy boundary.

Bt3—26 to 37 inches; light olive brown (2.5Y 5/4) clay; common medium distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; extremely hard, very firm; thin clay films on faces of peds; few fine pressure faces; few fine black concretions; mildly alkaline; gradual wavy boundary.

Bt4—37 to 63 inches; olive brown (2.5Y 4/4) clay; weak moderate subangular blocky structure; extremely hard, very firm; few thin clay films on faces of peds; few pressure faces; few calcium carbonate concretions; few soft bodies of calcium carbonate 5 to 10 millimeters in diameter; moderately alkaline; gradual wavy boundary.

BC—63 to 80 inches; olive yellow (2.5Y 6/8) clay; weak moderate subangular blocky structure; extremely hard, very firm; few weakly cemented shale fragments; few fine calcium carbonate concretions; moderately alkaline.

The solum ranges from 40 to more than 60 inches in thickness. Clay content in the upper 20 inches of the argillic horizon is 40 to 60 percent. Depth to secondary carbonates is 30 to 60 inches.

The A horizon is brown, dark brown, very dark grayish brown, or yellowish brown. The texture is fine sandy loam or loam. Some pedons contain as much as 10 percent, by volume, ironstone gravel on the surface and in the A horizon. Reaction is medium acid to neutral. The A horizon is less than 10 inches thick in more than half the pedon. It is massive and hard-setting when dry.

The Bt1 and Bt2 horizons are mottled red, light red, reddish brown, dark red, dark reddish brown, yellowish red, brownish yellow, yellowish brown, strong brown, brown, or olive yellow. The texture is clay. Reaction is medium acid to neutral. The Bt3 and Bt4 horizons are olive brown, light olive brown, or olive yellow. Mottles are few to common in shades of yellow or brown. The texture is clay, sandy clay, and clay loam. Concretions and soft bodies of calcium carbonate and ferromagnesium oxides range from 2 to 15 millimeters. Reaction is medium acid to moderately alkaline.

The BC horizon is olive yellow, dark grayish brown, brownish yellow, or very pale brown. It has a few mottles in shades of olive and yellow. The texture is clay, sandy clay, or clay loam. Thin fragments of shale are intermingled in the horizon. Calcium carbonate concretions range from 2 to 15 millimeters. Reaction is slightly acid to moderately alkaline.

Cuthbert Series

The Cuthbert series consists of deep, strongly sloping to moderately steep, well drained soils on uplands (fig. 20). These soils are moderately slowly permeable. They formed in acid stratified loamy and clayey sediments. Slope ranges from 5 to 20 percent. The soils of the Cuthbert series are clayey, mixed, thermic Typic Hapludults.

Typical pedon of Cuthbert fine sandy loam, 5 to 20 percent slopes; from Farm Road 831 in Flo, 1.5 miles southeast on Farm Road 1511, 3.1 miles southwest on a county road, and 25 feet north, in woodland.

A—0 to 2 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; soft, very friable; few fine and medium roots; strongly acid; clear wavy boundary.

E—2 to 6 inches; light yellowish brown (10YR 6/4) fine sandy loam; massive; soft, very friable; few fine and medium roots; very strongly acid; clear wavy boundary.

Bt—6 to 16 inches; yellowish red (5YR 5/8) clay; moderate medium subangular and angular blocky structure; firm, hard; clay films on faces of peds; few fine and medium roots; very strongly acid; gradual wavy boundary.

BC—16 to 24 inches; reddish yellow (5YR 6/6) clay loam; weak fine distinct light gray (10YR 7/2) shale; common medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; firm, hard; very strongly acid; gradual wavy boundary.

C—24 to 60 inches; stratified red (2.5YR 4/8) and reddish yellow (5YR 6/6) soft sandstone and pinkish gray (7.5YR 6/2) shale; common fine flakes of mica; very strongly acid.

The solum ranges from 20 to 40 inches in thickness. Base saturation is 14 to 33 percent. The clay content of the control section is 40 to 55 percent.

The A horizon is brown or dark brown. It has coarse fragments of ironstone that range up to 12 percent, by volume. Reaction is very strongly acid to slightly acid. The E horizon is brown, pale brown, or light yellowish brown. Combined thickness of the A and E horizons is 3 to 15 inches.

The Bt horizon is red or yellowish red with few to common brownish mottles mainly in the lower part. The texture is clay. Reaction is extremely acid to strongly acid.

The BC horizon is yellowish red or reddish yellow with red, brown, and light brownish gray mottles and light gray shale. The texture is clay loam or sandy clay loam. Reaction is extremely acid to strongly acid.

The C horizon is stratified sandy clay loam, shaly clay loam, sandstone, and shale in varying shades of red, yellow, and gray. It has common fine flakes of mica. Reaction is extremely acid or very strongly acid.

Derly Series

The Derly series consists of deep, nearly level, poorly drained soils on ancient terraces. These soils are very slowly permeable. They formed in clayey sediment in depressional areas. Slope is 0 to 1 percent. The soils of the Derly series are fine, montmorillonitic, thermic Typic Glossaqualfs.

Typical pedon of Derly silt loam, 0 to 1 percent slopes; from Texas Highway 7 in Malvern, 7 miles north on Farm Road 542 to Farm Road 3178, continue 2.3 miles north on Farm Road 542, 0.4 mile east of a four-way intersection, continue east 1.3 miles and southeast 0.4 mile, in pasture.

A—0 to 8 inches; dark brown (10YR 4/3) silt loam; common medium prominent grayish brown (10YR 5/2) mottles and few fine prominent very dark grayish brown (10YR 3/2) mottles; weak fine granular structure; slightly hard, friable; many fine roots; slightly acid; abrupt smooth boundary.

Eg—8 to 13 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent dark yellowish brown (10YR 4/4) mottles and common medium faint light gray (10YR 7/2) mottles; weak fine granular structure; slightly hard, friable; many fine roots; medium acid; clear smooth boundary.

Btg/E1—13 to 19 inches; grayish brown (10YR 5/2) clay; few fine prominent dark yellowish brown (10YR 4/4) mottles; about 20 percent, by volume, tongues and streaks of light brownish gray (10YR 6/2) silt loam; moderate medium subangular blocky structure; very hard, very firm; medium acid; gradual wavy boundary.

Btg/E2—19 to 40 inches; grayish brown (10YR 5/2) clay; about 15 percent, by volume, tongues and streaks of white (10YR 8/2) very fine sandy loam; moderate medium subangular blocky structure; very hard, very firm; patchy clay films on horizontal faces of peds; neutral; gradual wavy boundary.

BCg—40 to 80 inches; light brownish gray (10YR 6/2) clay; weak medium subangular blocky structure; very hard, very firm; common fine crystals of barium sulfate salts; neutral.

The solum is more than 60 inches thick.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, brown, or grayish brown. Few to common mottles of these colors are in most pedons. Reaction is very strongly acid to slightly acid.

The Eg horizon is grayish brown, light brownish gray, or light gray. Few to common mottles of these colors and of brown and light brown are in some pedons. Reaction is very strongly acid to medium acid. Combined thickness of the A and E horizons is 6 to 15 inches.

The Btg part of the Btg/E horizon is grayish brown or light brownish gray. The texture is clay or silty clay. The E part is light brownish gray, light gray, or pinkish white. Few to common mottles of yellowish brown and strong brown are in some pedons. The texture of the E part is silt loam or very fine sandy loam. Tongues and interfingering of E material make up 15 to 40 percent of the horizon. Reaction of the Btg/E horizon is very strongly acid to neutral.

The BCg horizon is grayish brown or light brownish gray. Few to common mottles of yellowish brown, yellow, and strong brown are in some pedons. The texture is clay or silty clay. Barium sulfate salts and gypsum crystals make up 25 percent, by volume, in some pedons. Reaction is medium acid to neutral.

Dimebox Series

The Dimebox series consists of deep, nearly level, moderately well drained soils on uplands (fig. 21). These soils are very slowly permeable. They formed in clayey marine sediment. Slope is 0 to 1 percent. The soils of the Dimebox series are fine, montmorillonitic, thermic Udic Pellusterts.

Typical pedon of Dimebox silty clay, 0 to 1 percent slopes; from Farm Road 977 in Leona, 1.65 miles south on Texas Highway 75, 1.7 miles west on a county road, 0.4 mile south and 400 feet west on county road, and 250 feet south, in native rangeland.

A1—0 to 4 inches; very dark gray (10YR 3/1) silty clay; strong fine angular blocky and strong fine granular structure; extremely hard, very firm; many fine and medium roots; many fine pores; very strongly acid; gradual wavy boundary.

A2—4 to 33 inches; black (N 2/0) clay; strong medium angular blocky structure; few slickensides; extremely hard, very firm; many fine and medium roots; many fine pores; 1 percent, by volume, ironstone gravel; medium acid; gradual wavy boundary.

Bw—33 to 49 inches; very dark gray (10YR 3/1) clay; common medium distinct light olive brown (2.5Y 5/4) mottles and common fine distinct olive (5Y 4/3) mottles; strong medium angular blocky structure; extremely hard, very firm; common fine roots; common fine pores; slickensides with vertical axis tilting 10 to 60 degrees from horizontal plane; common parallelepiped aggregates; 2 percent, by volume, ironstone gravel 3 to 20 millimeters in diameter; few nodules of calcium carbonate; noncalcareous, neutral; clear wavy boundary.

Bk—49 to 71 inches; olive yellow (2.5Y 6/6) clay; common fine distinct gray (10YR 5/1) mottles; strong medium angular blocky structure; extremely hard, very firm; common fine roots; few very fine pores; intersecting slickensides tilted 10 to 60 degrees from horizontal axis; common parallelepiped aggregates; 3 percent, by volume, ironstone gravel 5 to 30 millimeters in diameter; about 8 percent, by volume, concretions of calcium carbonate; calcareous, moderately alkaline; diffuse wavy boundary.

BC—71 to 83 inches; gray (10YR 6/1) clay; many medium distinct brownish yellow (10YR 6/8) mottles and common medium distinct very pale brown (10YR 7/3) mottles; strong medium angular blocky structure; extremely hard, very firm; few fine roots; few very fine pores; common slickensides tilted 10 to 60 degrees from horizontal axis; few nodules of calcium carbonate; calcareous; mildly alkaline; gradual wavy boundary.

C—83 to 91 inches; brownish yellow (10YR 6/8) clay; common medium distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium platy structure; extremely hard, very firm; few fine roots; calcareous; mildly alkaline.

The A and B horizons are cyclic, ranging from 40 to 90 inches in thickness. Rounded ironstone pebbles range from a few to about 5 percent throughout the solum. Some areas contain rounded gravel. In more than 50 percent of the pedons, horizons that have chroma of less than 1.5 and value of less than 3.5 range from 12 to 65 inches in thickness. In virgin areas, gilgai microrelief consists of microhighs 6 to 16 inches higher than the microlows. The distance between the center of high and the center of low is 5 to 18 feet. When these soils are dry, cracks 1 to 3 inches wide extend from the surface to a depth of 60 inches or more. All pedons have intersecting slickensides at a depth of more than 36 inches, but in some pedons, the slickensides occur as shallow as 15 inches below the surface.

The A horizon is black or very dark gray. The texture is clay or silty clay. Reaction ranges from very strongly acid to neutral. The A horizon ranges from absent in some microhighs to 65 inches thick in the microlows.

The B horizon is very dark gray, dark gray, gray, very dark grayish brown, dark grayish brown, grayish brown, brown, yellowish brown, brownish yellow, olive brown, light olive brown, olive gray, and olive. Mottles in shades of yellow, brown, gray, and olive range from few to many. Some parts of the matrix are calcareous. Concretions of pitted calcium carbonate range from none to common, and pockets of this material range from none to many. Calcium sulfate crystals range from none to common. Intersecting slickensides range from common to many and are a few inches to several feet across. Reaction is strongly acid to moderately alkaline.

The C horizon is mostly stratified clay, shale, and weakly cemented sandstone. It is in shades of yellow, brown, gray, and olive with mottles of these same colors. Reaction is strongly acid to moderately alkaline.

Dutek Series

The Dutek series consists of deep, gently sloping to strongly sloping, well drained soils on ancient terraces. These soils are moderately permeable. They formed in loamy and sandy material. Slope ranges from 1 to 8 percent. The soils of the Dutek series are loamy, siliceous, thermic Arenic Haplustalfs.

Typical pedon of Dutek loamy fine sand, 1 to 8 percent slopes; from Farm Road 39 in Jewett, 1.8 miles west on U.S. Highway 79, 1.2 miles north on Farm Road 1512 to Newby, 4.35 miles west on Farm Road 1469, and 200 feet south, in improved pasture.

A—0 to 4 inches; pale brown (10YR 6/3) loamy fine sand; weak fine granular structure; loose, very friable; many fine roots; medium acid; clear smooth boundary.

E—4 to 31 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose, friable; few roots; medium acid; clear smooth boundary.

Bt—31 to 51 inches; yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few patchy clay films on faces of peds; medium acid; gradual smooth boundary.

BC—51 to 60 inches; reddish yellow (7.5YR 6/6) fine sandy loam; weak medium subangular blocky structure; slightly hard, friable; medium acid; gradual smooth boundary.

C—60 to 84 inches; very pale brown (10YR 7/4) loamy fine sand; few yellowish red (5YR 5/8) stains and spots; weak coarse prismatic structure; soft, very friable; medium acid.

The solum ranges from 60 to more than 80 inches in thickness.

The A horizon is brown or pale brown. The E horizon is light yellowish brown, very pale brown, or reddish yellow. Reaction is slightly acid or medium acid. Combined thickness of the A and E horizon is 20 to 40 inches.

The Bt horizon is yellowish red. The texture is sandy clay loam. Clay content is 20 to 35 percent. Reaction is strongly acid or medium acid.

The BC horizon is reddish yellow or strong brown. The texture is fine sandy loam or sandy clay loam. Reaction is very strongly acid to medium acid.

The C horizon is yellowish red, reddish yellow, strong brown, very pale brown, or brown. The texture is loamy fine sand or fine sandy loam. Reaction is very strongly acid to slightly acid.

Elrose Series

The Elrose series consists of deep, gently sloping to strongly sloping, well drained soils on uplands. These soils are moderately permeable. They formed in stratified marine sediment high in glauconite. Slope ranges from 3 to 8 percent. The soils of the Elrose series are fine-loamy, siliceous, thermic Typic Paleudalfs.

Typical pedon of Elrose fine sandy loam, 3 to 8 percent slopes; from Texas Highway 7 at Malvern, 7 miles north on Farm Road 542 to Farm Road 3178, continue 5.2 miles north on Farm Road 542, 1.5 miles west and southwest on private road, and 1,800 feet southwest, in pasture.

Ap—0 to 8 inches, reddish brown (5YR 4/4) fine sandy loam; moderate medium granular structure; slightly hard, very friable; common fine roots; slightly acid; clear smooth boundary.

A—8 to 18 inches, red (2.5YR 4/6) sandy loam; moderate medium granular structure; slightly hard, very friable; common fine roots; medium acid; gradual wavy boundary.

Bt1—18 to 45 inches, red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; patchy clay films on faces of peds; medium acid; gradual wavy boundary.

Bt2—45 to 80 inches, red (2.5YR 4/8) sandy clay loam; weak medium subangular blocky structure; hard, friable; patchy clay films on faces of peds; medium acid.

The solum ranges from 60 to more than 80 inches in thickness. A few ironstone fragments occur throughout the soil in most pedons.

The A horizon is dark reddish brown, reddish brown, or yellowish red. The texture is fine sandy loam or sandy loam. Reaction is medium acid or slightly acid. The A horizon is 4 to 20 inches thick.

The Bt horizon is dark red or red. The texture is sandy clay loam or clay loam. Average clay content of the upper 20 inches of the Bt horizon is 22 to 35 percent clay. Reaction ranges from very strongly acid to slightly acid.

Some pedons have a BC horizon that is red fine sandy loam. Reaction is very strongly acid to slightly acid. Weathered glauconitic material ranges from a few fragments to 20 percent, by volume.

Eufaula Series

The Eufaula series consists of deep, gently sloping, somewhat excessively drained soils on terraces (fig. 22). These soils are rapidly permeable. They formed in sandy sediment of the Navasota River and its tributaries. Slope ranges from 1 to 5 percent. The soils of the Eufaula series are sandy, siliceous, thermic Psammentic Paleustalfs.

Typical pedon of Eufaula loamy fine sand, 1 to 5 percent slopes; from Texas Highway 7 in Marquez, 0.4 mile north on U.S. Highway 79, 0.5 mile north on Farm Road 1146, 4.2 miles northwest on a county road, 2.2 miles northeast, north, and northwest on a private ranch road to oil well site, and 300 feet northwest, in post oak forest.

A—0 to 9 inches, dark yellowish brown (10YR 4/4) loamy fine sand; single grained; loose and very friable; common fine roots; medium acid; gradual smooth boundary.

E—9 to 51 inches; yellowish brown (10YR 5/4) loamy fine sand; single grained; loose and very friable; few fine roots; medium acid; diffused smooth boundary.

E&Bt—51 to 80 inches; yellowish brown (10YR 5/4) sand; single grained, loose (E); lamellae of strong brown (7.5YR 5/6) loamy fine sand; massive; slightly hard, friable (Bt); wavy and discontinuous 0.125 inch to 1 inch thick and 0.5 to 3 inches apart; clay bridges between sand grains in lamellae; medium acid.

The solum ranges from 72 to more than 80 inches in thickness.

The A horizon is dark grayish brown, brown, dark brown, or dark yellowish brown. The E horizon is yellowish brown or light yellowish brown. The texture of the E horizon is mainly loamy fine sand, but it ranges to fine sand. Reaction of the A and E horizons is medium acid or slightly acid. The combined thickness of these horizons ranges from 40 to 50 inches.

The E part of the E&Bt horizon is light yellowish brown or yellowish brown. The texture is mainly loamy fine sand, but it ranges to fine sand or sand. The E material makes up from 55 to 75 percent of the horizon. The Bt material is strong brown or brown loamy fine sand, sandy loam, or loam in wavy discontinuous lamellae. Reaction of the E&Bt horizon ranges from strongly acid to slightly acid.

Ferris Series

The Ferris series consists of deep, gently sloping to moderately steep, well drained soils on uplands. These soils are very slowly permeable. They formed in weakly consolidated clays and marls. Slope ranges from 1 to

15 percent. The soils of the Ferris series are fine, montmorillonitic, thermic Udorthentic Chromusterts.

Typical pedon of Ferris clay, 1 to 5 percent slopes; from Texas Highway 7 in Marquez, 0.4 mile north on U.S. Highway 79, 0.6 mile northwest on Farm Road 1146, and 3 miles northwest on a county road; in an open pasture on the Marquez Dome (the only Cretaceous age outcrop in the county).

A—0 to 3 inches; very dark grayish brown (10YR 3/2) clay; strong medium angular blocky structure; very hard, very firm; calcareous; moderately alkaline; clear wavy boundary.

Bw—3 to 36 inches; grayish brown (2.5Y 5/2) clay; strong medium angular blocky structure; extremely hard, extremely firm; common coarse intersecting slickensides; calcareous; moderately alkaline; diffuse wavy boundary.

BCk—36 to 68 inches; light olive brown (2.5Y 5/4) clay; common medium prominent very dark gray (10YR 3/1) mottles; moderate medium angular blocky structure; extremely hard, extremely firm; few coarse slickensides; 5 percent, by volume, calcium carbonate concretions; calcareous; moderately alkaline.

The solum ranges from 30 to more than 60 inches in thickness. Clay content is 40 to 60 percent. These soils are moderately alkaline and calcareous throughout the solum.

The A horizon is very dark grayish brown and dark grayish brown. In pedons where the moist color value is less than 3.5, the horizon is less than 12 inches thick.

The Bw horizon is grayish brown, light olive brown, light brownish gray, and olive gray. Intersecting slickensides and shiny pressure faces mainly occur below a depth of 24 inches.

The BCk horizon is light brownish gray, light olive brown, light yellowish brown, and pale olive. The texture is clay or shaly clay.

Flo Series

The Flo series consists of deep, gently sloping to strongly sloping, somewhat excessively drained soils on uplands. These soils are rapidly permeable. They formed in thick beds of sandy sediment. Slope ranges from 1 to 8 percent. The soils of the Flo series are sandy, siliceous, thermic Psammentic Paleudalfs.

Typical pedon of Flo loamy fine sand, 1 to 8 percent slopes; from Farm Road 542 in Oakwood, 4.5 miles west on U.S. Highway 79, 1.5 miles south on a county road, 350 feet east on trail, and 15 feet north; in woodland.

A—0 to 6 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; soft, very friable; many fine and medium roots; medium acid; clear smooth boundary.

E—6 to 17 inches; very pale brown (10YR 7/3) loamy fine sand; single grained; soft, very friable; many fine and medium roots; strongly acid; diffuse smooth boundary.

Bw—17 to 36 inches; yellowish brown (10YR 5/4) loamy fine sand; common small spots of strong brown (7.5YR 5/6); single grained; soft, very friable; few fine and medium roots; very strongly acid; gradual smooth boundary.

Bt—36 to 53 inches; light brown (7.5YR 6/4) loamy fine sand; common strong brown (7.5YR 5/6) lamellae 5 to 15 millimeters thick and spaced 2 to 4 inches apart; weak coarse subangular blocky structure; soft, very friable; coatings of sand grains and some clay bridging in lamellae; few fine roots; very strongly acid; gradual smooth boundary.

E&Bt—53 to 84 inches; pink (7.5YR 7/4) loamy fine sand (E); common yellowish red (5YR 5/6) fine sandy loam (Bt) lamellae 5 to 20 millimeters thick; sand is single grained; lamellae are massive; soft, very friable; coatings of sand grains and some clay bridging in lamellae; very strongly acid.

The solum ranges from 60 to 80 inches in thickness. Reaction is very strongly acid to medium acid.

The A horizon is brown, dark brown, very dark grayish brown, dark grayish brown, dark yellowish brown, or yellowish brown. It generally is 4 to 21 inches thick, but in pedons that have darker colors, it is less than 10 inches thick.

The E horizon is brown, strong brown, grayish brown, yellowish brown, brownish yellow, very pale brown, or yellow. It is 11 to 43 inches thick.

The Bw horizon is yellowish red, strong brown, or yellowish brown. It is 10 to 30 inches thick.

The Bt horizon is light brown, strong brown, reddish yellow, or pink. It has 3 to 8 percent more clay than the Bw horizon.

The E part of the E&Bt horizon is reddish yellow, pink, very pale brown, or white. The Bt part (lamellae) is reddish brown, yellowish red, or strong brown. Texture of the E part is loamy fine sand; the Bt part is loamy fine sand or fine sandy loam. The lamellae range from [illegible] to [illegible] inch in thickness. Composite thickness ranges from 4 to 6 inches within a depth of 80 inches.

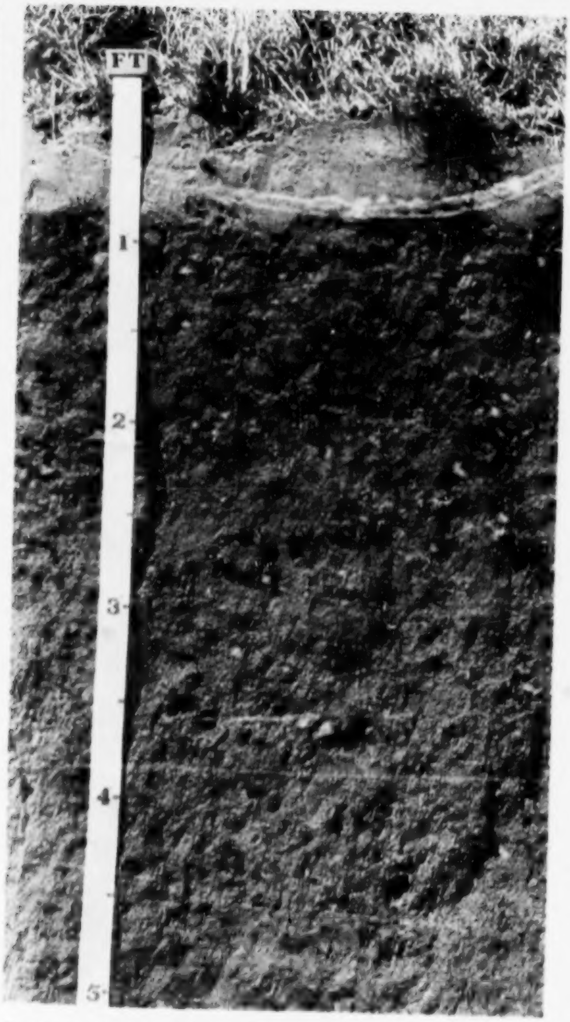

Figure 17.—A profile of Attoyac fine sandy loam. The subsoil is red sandy clay loam and has subangular blocky structure.

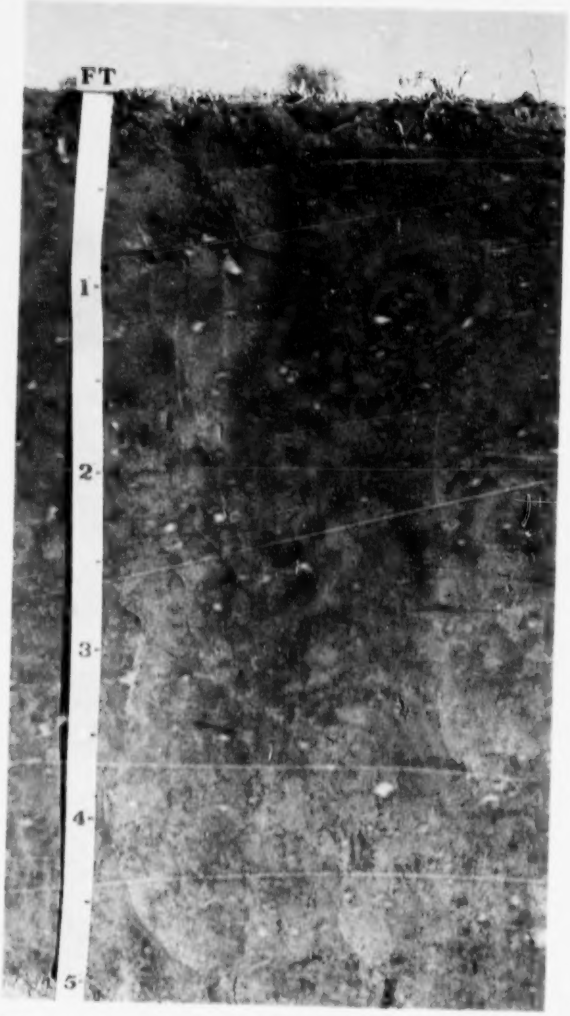

Figure 18.—A profile of Bienville loamy fine sand. The lower part of the soil is loamy fine sand with spots and streaks of uncoated sand grains.

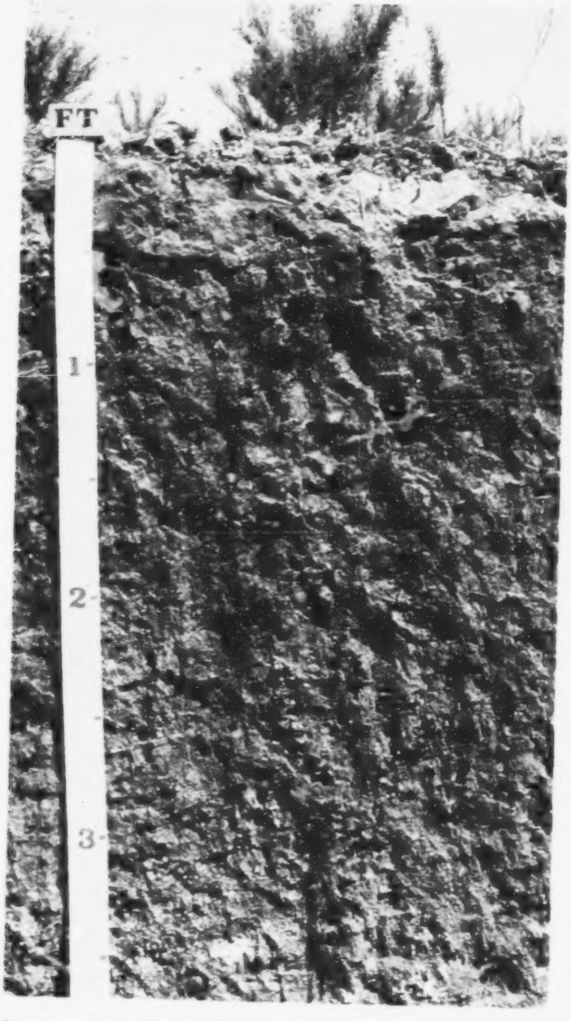

Figure 19.—A profile of Crockett fine sandy loam. The subsoil is very dense clay that is very slowly permeable. It is penetrated by water and plant roots only with great difficulty.

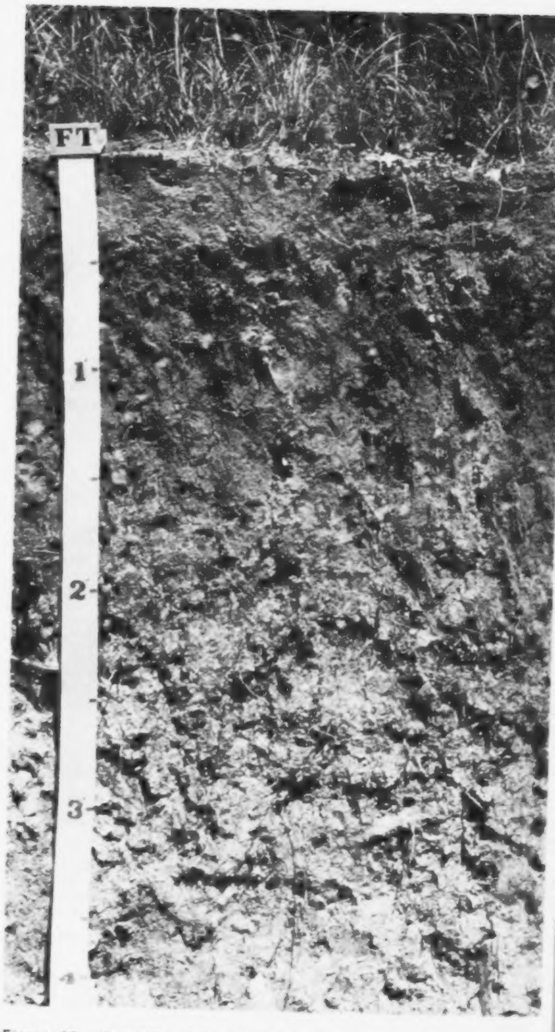

Figure 20.—A profile of Cuthbert fine sandy loam. The subsoil, which begins at a depth of about 6 inches, is reddish clay that grades to grayish shale in the lower part.

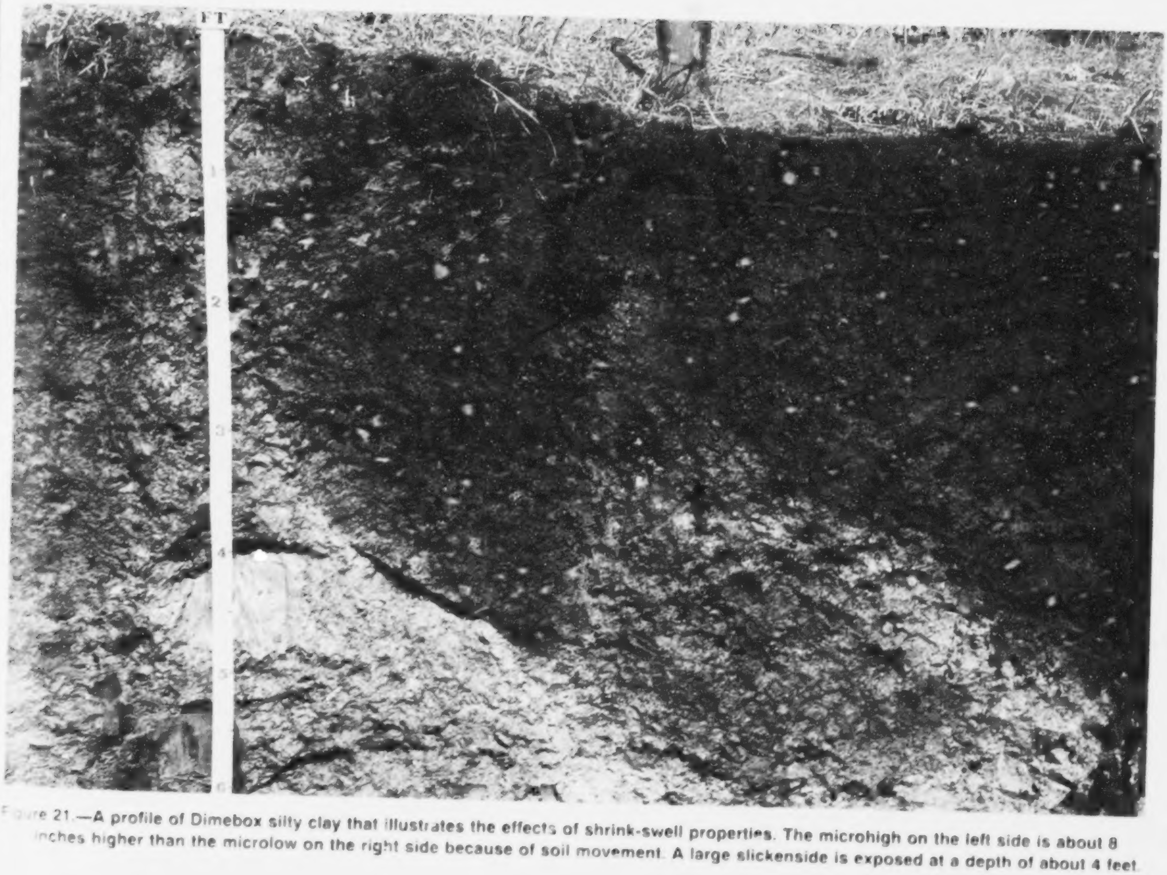

Figure 21.—A profile of Dimebox silty clay that illustrates the effects of shrink-swell properties. The microhigh on the left side is about 8 inches higher than the microlow on the right side because of soil movement. A large slickenside is exposed at a depth of about 4 feet.

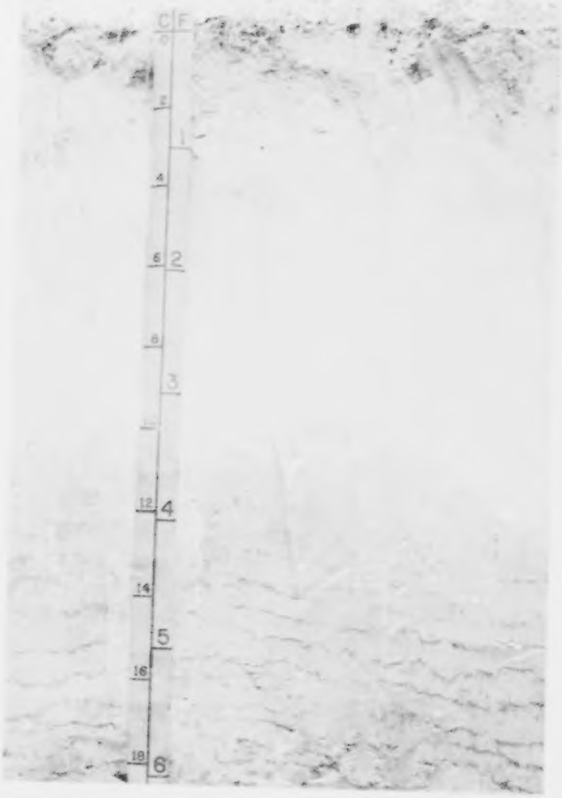
C F
2
1
4
6 2
8
3
12 4
14
5
16
18 6

Figure 22.—A profile of Eufaula loamy fine sand. In the lower part, the soil has thin lamellae.

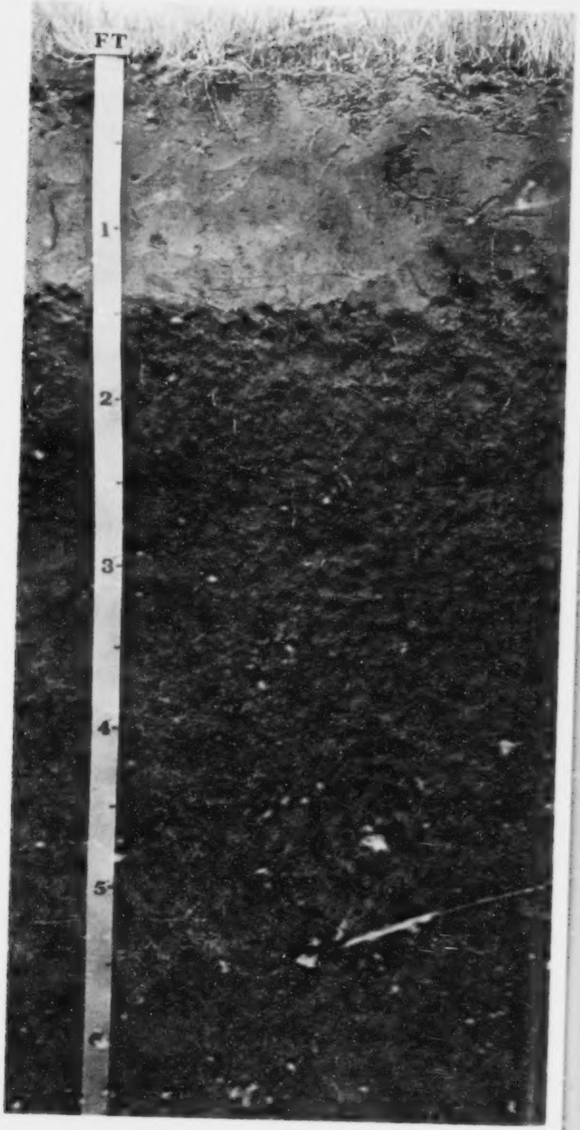

Figure 23.—A profile of Gasil fine sandy loam, 1 to 5 percent slopes. The subsoil is yellowish brown sandy clay loam.

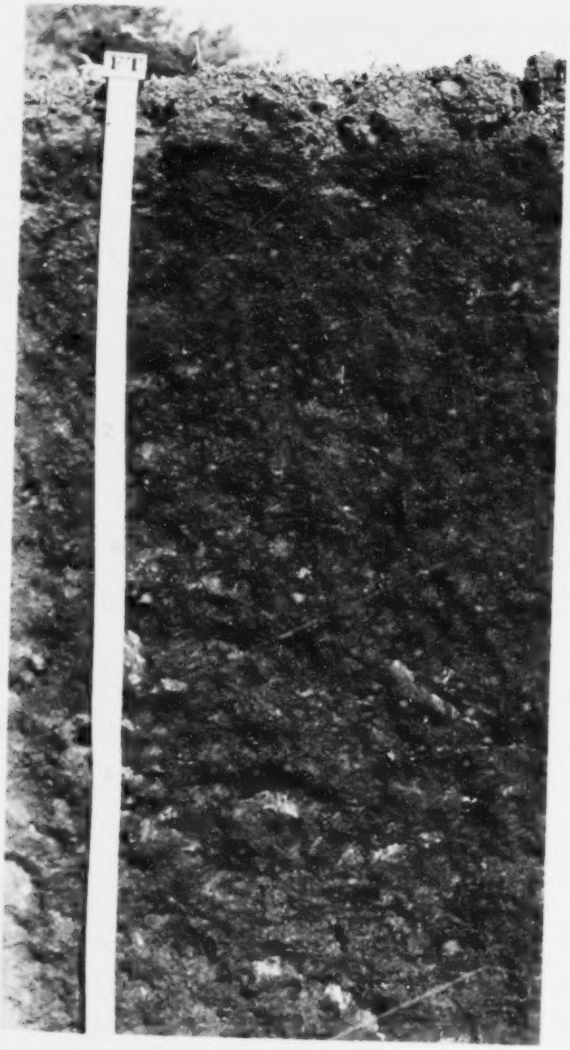

Figure 24.—A profile of Kaufman clay. This soil formed in alluvium on the Trinity River flood plain.

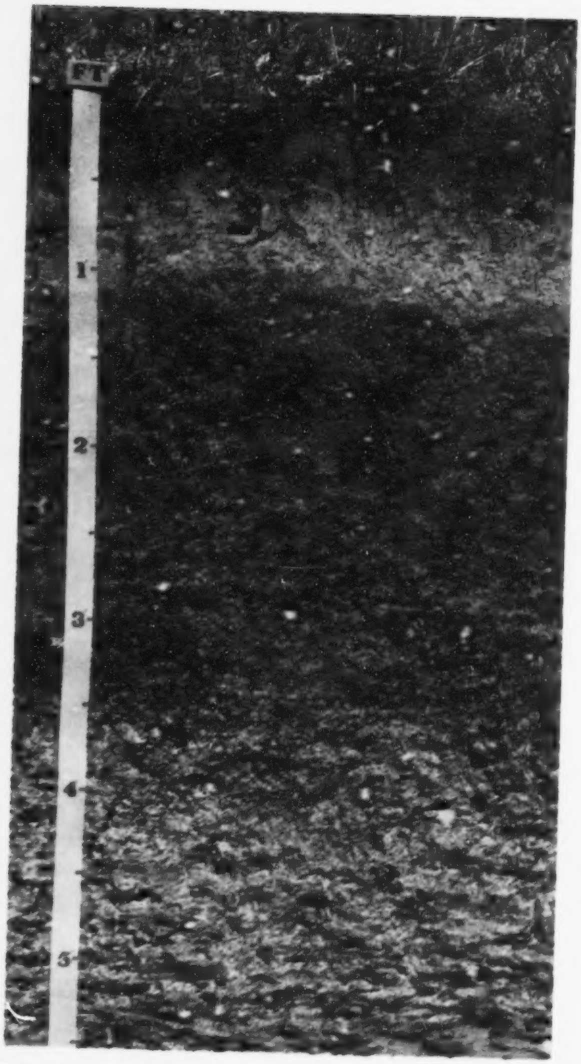

Figure 25.—A profile of Kirvin fine sandy loam. Stratified clay shale and sandstone layers begin at a depth of about 4 feet.

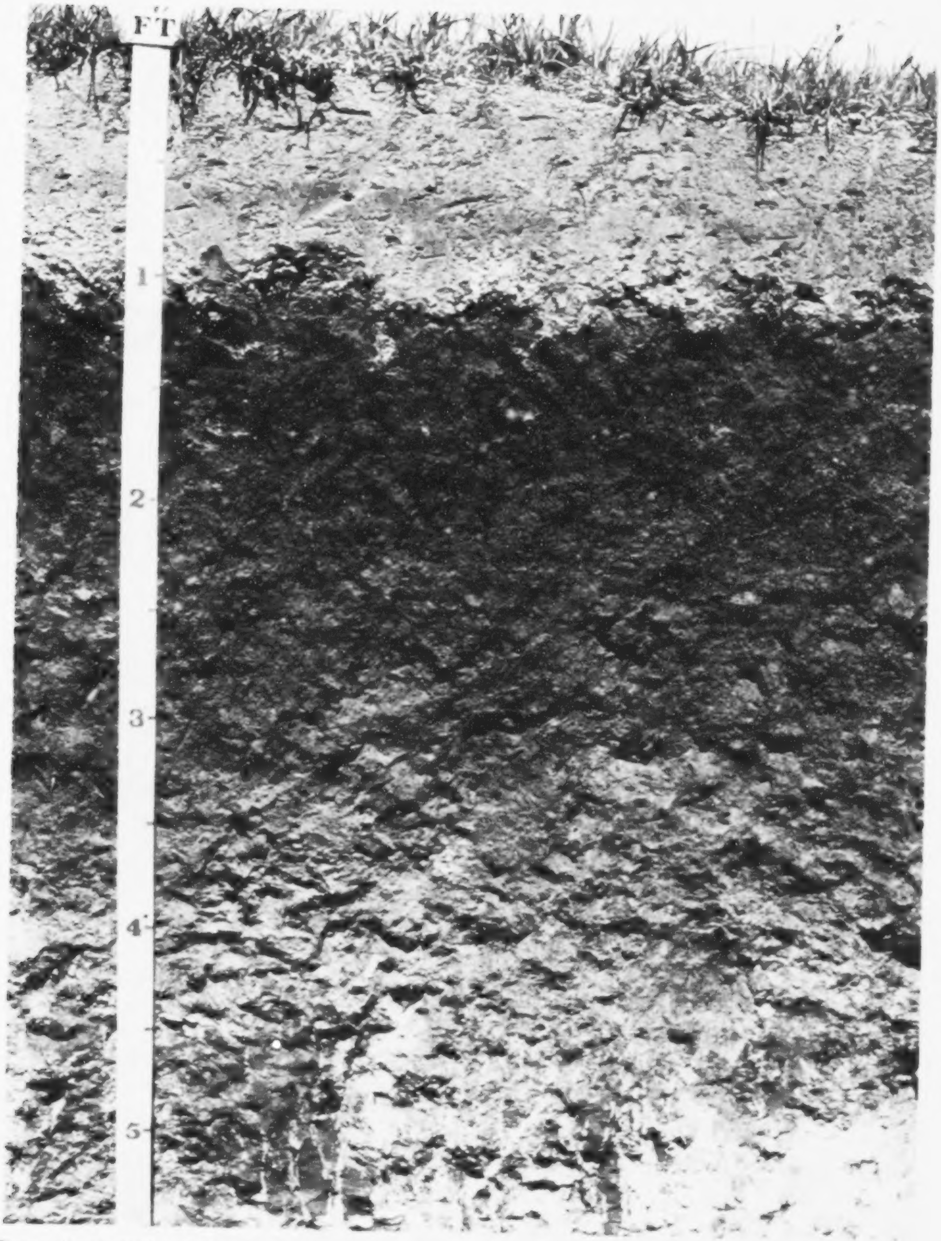

Figure 26.—A profile of Marquez very fine sandy loam. The reddish clay subsoil has blocky structure and is underlain by shale and sandstone at a depth of about 50 inches.

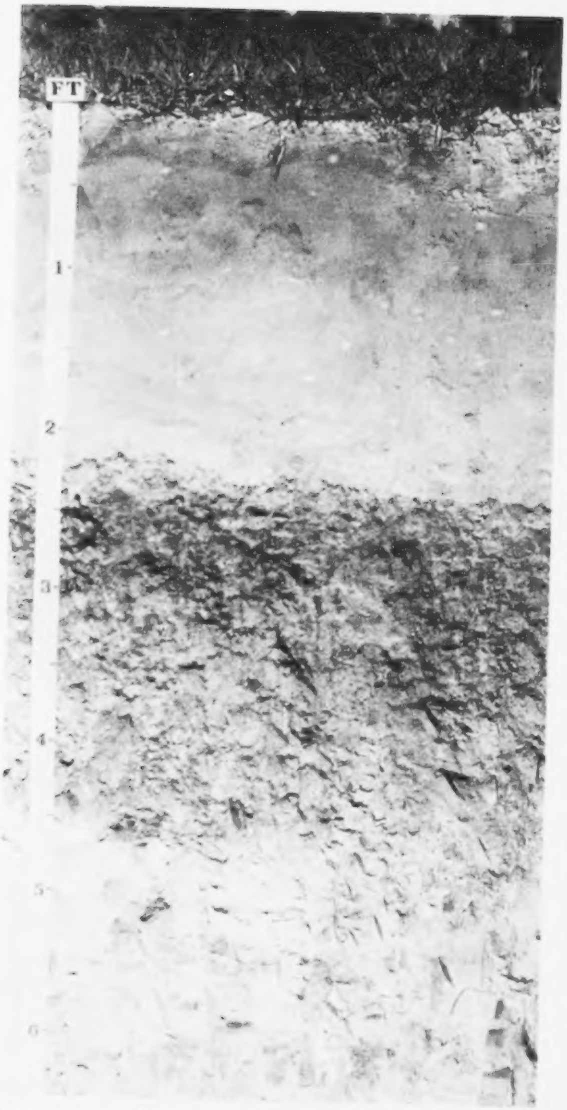

Figure 27.—A profile of Robco loamy fine sand. The subsoil, which begins at a depth of about 25 inches, is dominantly grayish brown, mottled clay.

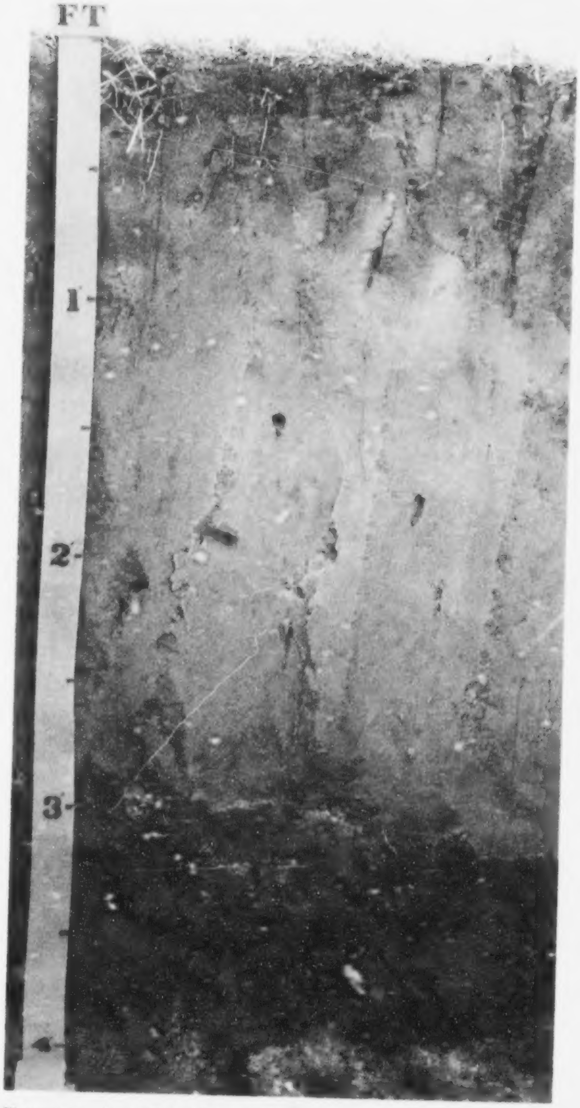

Figure 28.—A profile of Silstid loamy fine sand. This soil has thick sandy surface and subsurface layers and a loamy subsoil.

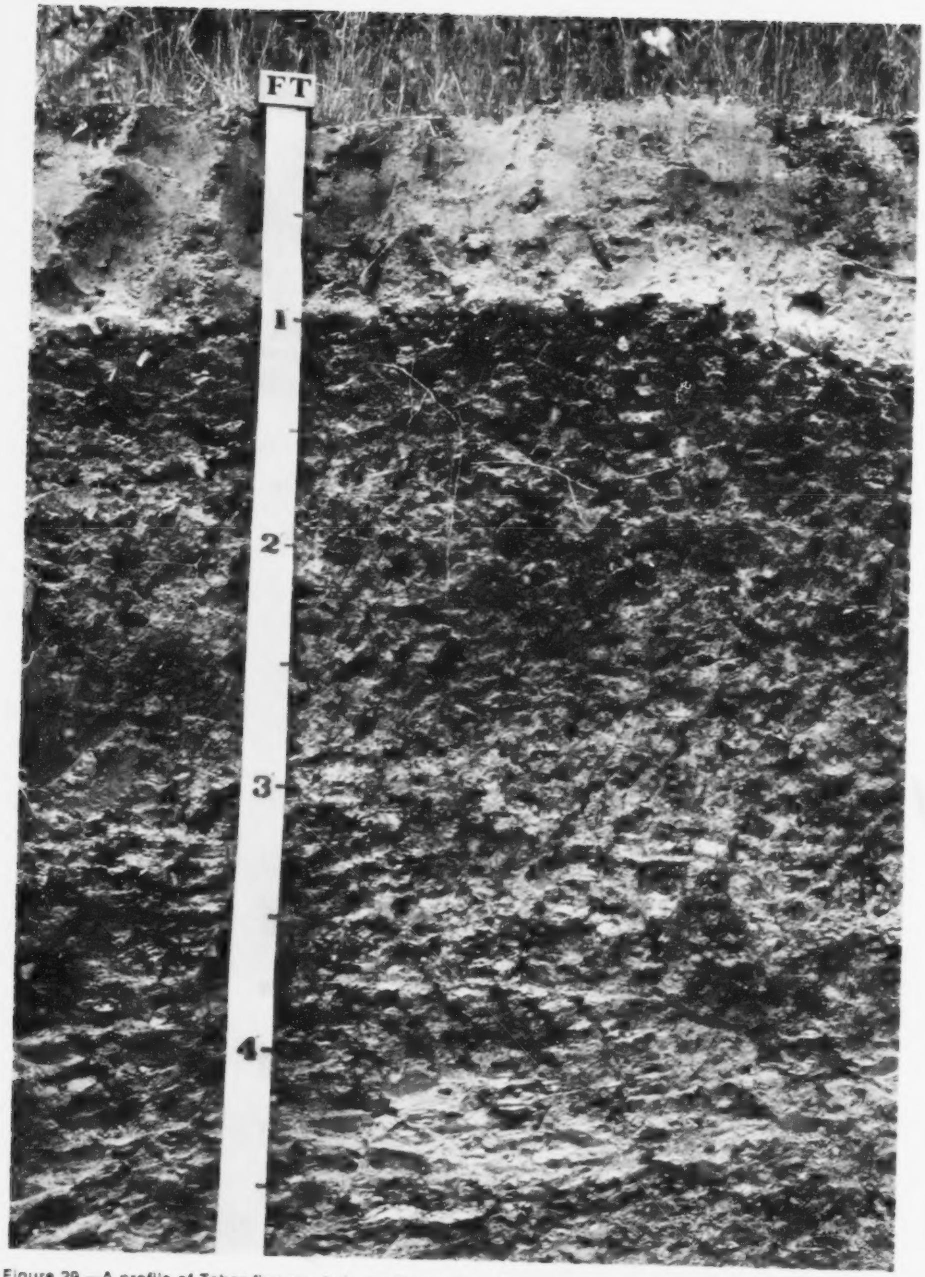

Figure 29.—A profile of Tabor fine sandy loam. The texture changes abruptly from fine sandy loam to dense clay at a depth of about 12 inches.

Flynn Series

The Flynn series consists of deep, gently sloping to strongly sloping, well drained soils on uplands. These soils are moderately permeable. They formed in weathered colluvial sediment of glauconitic material. Slope is dominantly 3 to 8 percent. The soils of the Flynn series are fine-loamy, siliceous, thermic Udic Paleustalfs.

Typical pedon of Flynn fine sandy loam, 3 to 8 percent slopes, from Texas Highway 7 in Robbins, 1.8 miles north on Farm Road 39, and 100 feet northeast, in rangeland.

A1—0 to 8 inches; dark reddish brown (5YR 3/4) fine sandy loam; moderate fine and medium granular structure; slightly hard, very friable; common fine roots; few fine iron enriched pebbles; neutral; clear smooth boundary.

A2—8 to 12 inches; dark reddish brown (2.5YR 3/4) loam; moderate medium granular structure; slightly hard, very friable; common fine roots; few fine ironstone pebbles; neutral; clear smooth boundary.

Bt1—12 to 30 inches; dark reddish brown (2.5YR 3/4) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; common fine pores; few fine ironstone pebbles 3 to 5 millimeters in diameter; clay films on surfaces of peds; slightly acid; gradual wavy boundary.

Bt2—30 to 55 inches; dark reddish brown (2.5YR 3/4) sandy clay loam; common medium faint dusky red (2.5YR 3/2) stains; weak medium subangular blocky structure; hard, friable; few fine roots; common fine pores; few ironstone pebbles 3 to 5 millimeters in diameter; clay films on surfaces of peds; slightly acid; gradual wavy boundary.

Bt3—55 to 72 inches; dark red (2.5YR 3/6) sandy clay loam; weak medium subangular blocky structure; hard, friable; few fine roots; few fine pores; clay films on surfaces of peds; few ironstone pebbles; few fragments of weathered glauconitic material; slightly acid; gradual wavy boundary.

BC—72 to 80 inches; red (2.5YR 4/6) loam; weak fine subangular blocky structure; slightly hard, very friable; few ironstone pebbles; few fragments of weathered glauconitic material; slightly acid.

The solum ranges from 60 to more than 80 inches in thickness. Ironstone pebbles range from 1 to 10 percent, by volume, throughout.

The A horizon is dark red, dark reddish brown, reddish brown, red, dark brown, and brown. In pedons that have chroma of 2, the A horizon is less than 6 inches thick. Reaction ranges from medium acid to neutral.

The Bt horizon is dark reddish brown, reddish brown, dark red, red, yellowish red, strong brown, or yellowish brown. The texture is sandy clay loam or clay loam with average clay content of 22 to 35 percent in the control section. Fragments of brownish weathered glauconitic material range from 0 to about 10 percent, by volume, in the lower part of the horizon. Reaction ranges from strongly acid to neutral.

The BC horizon is reddish brown or red sandy clay loam, fine sandy loam, or loam. Weathered glauconitic material ranges from a few fragments to 25 percent, by volume. Horizontally oriented fragments of ironstone 0.5 inch to 3 inches thick and up to 18 inches across range from 0 to about 15 percent, by volume. Some pedons have a few streaks of uncoated sand. Reaction ranges from strongly acid to slightly acid.

Some pedons have a C horizon that is reddish or brownish unconsolidated sandy or loamy sediment that contains weathered glauconitic sandstone. Horizontally oriented fragments of ironstone 0.5 inch to 3 inches thick and up to 18 inches across range from 0 to 10 percent, by volume. Reaction ranges from very strongly acid to slightly acid.

Garner Series

The Garner series consists of deep, nearly level, poorly drained soils on ancient stream terraces. These soils are very slowly permeable. They formed in clayey sediment. Slope is 0 to 1 percent. The soils of the Garner series are fine, montmorillonitic, thermic Entic Pelluderts.

Typical pedon of Garner clay, 0 to 1 percent slopes; from Texas Highway 75 in Centerville, 16 miles east on Texas Highway 7, and 80 feet north, in a field.

A—0 to 4 inches; dark gray (10YR 4/1) clay; moderate fine angular blocky structure; extremely hard, very firm, very sticky and very plastic; many fine roots; few fine pores; slightly acid; clear wavy boundary.

Bg—4 to 25 inches; gray (10YR 5/1) clay; few fine distinct brown (7.5YR 5/4) mottles; strong medium angular blocky structure; few parallelepipeds tilted 20 degrees from horizontal; few slickensides; extremely hard, very firm, very sticky and very plastic; medium acid; gradual wavy boundary.

BCg—25 to 65 inches; light gray (10YR 6/1) clay; few fine distinct yellowish brown mottles; many intersecting slickensides; distinct parallelepipeds tilted 20 to 45 degrees from horizontal; extremely hard, very firm, very sticky and very plastic; few fine weakly cemented black concretions; medium acid.

Gilgai microrelief consists of knolls 5 to 12 feet in diameter and 4 to 10 inches higher than the depressions. Intersecting slickensides begin at a depth of 20 to 30 inches. Clay content of the control section is 50 to 60 percent.

The A horizon is dark gray or gray. In some pedons, it has brown or yellow mottles. Reaction is medium acid or slightly acid.

The Bg horizon is gray, light gray, or dark gray with few to common brown, yellow, or red mottles. Reaction ranges from medium acid to neutral.

The BCg horizon is gray, light gray, or light brownish gray with brown, yellow, or olive mottles. Reaction ranges from medium acid to moderately alkaline.

Gasil Series

The Gasil series consists of deep, gently sloping and strongly sloping, well drained soils on uplands (fig. 23). These soils are moderately permeable. They formed in deeply weathered, loamy sediment. Slope ranges from 1 to 8 percent. The soils of the Gasil series are fine-loamy, siliceous, thermic Ultic Paleustalfs.

Typical pedon of Gasil fine sandy loam, 1 to 5 percent slopes, from Texas Highway 7 in Marquez, 0.4 mile north on U.S. Highway 79, 0.5 mile north on Farm Road 1146, 3.5 miles northwest on a county road, and 100 feet west, in pasture.

A—0 to 5 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; soft, very friable; common fine roots; neutral; clear smooth boundary.

E—5 to 16 inches; pale brown (10YR 6/3) fine sandy loam; weak fine granular structure; soft, very friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—16 to 20 inches; dark yellowish brown (10YR 4/6) sandy clay loam; few fine faint reddish yellow mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; patchy clay films on faces of peds; medium acid; gradual wavy boundary.

Bt2—20 to 47 inches; dark yellowish brown (10YR 4/6) sandy clay loam; common medium prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; hard, firm; few fine roots; patchy clay films on faces of peds; medium acid; gradual wavy boundary.

Bt3—47 to 72 inches; brownish yellow (10YR 5/6) sandy clay loam; common medium prominent red (2.5YR 4/6) mottles; weak medium subangular blocky structure; hard, firm; few patchy clay films on faces of peds; medium acid.

The solum ranges from 60 to more than 100 inches in thickness. The control section is 18 to 35 percent clay. Fine ironstone pebbles range from none to about 5 percent throughout the solum.

The A horizon is pale brown, brown, dark brown, dark yellowish brown, or yellowish brown. Reaction ranges from strongly acid to neutral. The E horizon is yellowish brown, light yellowish brown, pale brown, or very pale brown. Reaction is medium acid or slightly acid. The combined thickness of the A and E horizons is 5 to 20 inches.

The Bt horizon is dark yellowish brown, yellowish brown, brownish yellow, or strong brown. It has few to common mottles in various shades of red and yellow. The texture is sandy clay loam or loam. Reaction ranges from strongly acid to slightly acid.

Gladewater Series

The Gladewater series consists of deep, nearly level, poorly drained and very poorly drained soils on bottom lands. These soils are very slowly permeable. They formed in clayey alluvium. These soils are subject to flooding. Slope is generally less than 1 percent. The soils of the Gladewater series are fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts.

Typical pedon of Gladewater clay, frequently flooded, from Texas Highway 7 at Marquez, 0.4 mile north on U.S. Highway 79, 0.6 mile northwest on Farm Road 1146, 4.2 miles northwest on a county road, 0.8 mile northwest on a private road, and 1,300 feet west, on bottom land.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) clay; moderate medium subangular blocky structure; extremely hard, extremely firm; slightly acid; gradual smooth boundary.

Bg1—8 to 23 inches; dark gray (10YR 4/1) clay; common fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; few fine pores; few roots; extremely hard, extremely firm; slightly acid; gradual smooth boundary.

Bg2—23 to 45 inches; dark gray (10YR 4/1) clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure;

extremely hard, extremely firm; common pressure faces; slightly acid; gradual smooth boundary.

Cg1—45 to 52 inches; gray (10YR 5/1) clay; massive; common fine streaks of salts; extremely hard, extremely firm; moderately alkaline; clear smooth boundary.

Cg2—52 to 80 inches; gray (10YR 5/1) clay; massive; extremely hard, extremely firm; moderately alkaline.

The solum ranges from 20 to 50 inches in thickness. The texture is clay with a clay content of 40 to 60 percent.

The A horizon is very dark grayish brown, very dark gray, dark gray, and grayish brown. Mottles are few to common in various shades of brown. Reaction is medium acid to neutral.

The Bg horizon is dark gray, gray, light gray, dark grayish brown, grayish brown, or light brownish gray. Grayish, brownish, or yellowish mottles range from few to many. Reaction is strongly acid to slightly acid.

The Cg horizon is varying shades of gray. Reaction is strongly acid to moderately alkaline.

Gowker Series

The Gowker series consists of deep, nearly level, moderately well drained soils on bottom lands. These soils are slowly permeable. They formed in loamy and clayey alluvium. These soils are subject to flooding. Slope is 0 to 1 percent. The soils of the Gowker series are fine-loamy, mixed, thermic Cumulic Hapludolls.

Typical pedon of Gowker clay loam, frequently flooded; 17 miles east of Centerville on Texas Highway 7 to Malvern, 8.25 miles north on Farm Road 542, 3.2 miles east on a private ranch road, and 0.5 mile east of Clear Lake, in a pasture near the Trinity River.

A1—0 to 13 inches; very dark gray (10YR 3/1) clay loam; moderate medium granular and subangular blocky structure; hard, friable; slightly acid; gradual smooth boundary.

A2—13 to 24 inches; very dark grayish brown (10YR 3/2) clay loam; weak moderate subangular blocky structure; hard, friable; common fine pores; slightly acid; gradual smooth boundary.

C1—24 to 40 inches; dark grayish brown (10YR 4/2) sandy clay loam; many medium distinct dark brown (7.5YR 4/4) mottles; massive; very hard, firm; few fine roots; few fine pores; neutral; gradual smooth boundary.

C2—40 to 56 inches; mottled yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) sandy loam; massive; slightly hard, very friable; slightly acid; gradual smooth boundary.

C3—56 to 80 inches; grayish brown (10YR 5/2) loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; hard, friable; medium acid.

The A horizon is 24 to 30 inches thick. It is very dark gray, very dark brown, or very dark grayish brown. Reaction is medium acid or slightly acid in the A1 horizon and ranges from medium acid to neutral in the A2 horizon.

The C1 horizon is dark grayish brown, grayish brown, or brown. Mottles are common to many in shades of brown and gray. The texture is sandy clay loam or clay loam. Stratifications and layers of sandy loam or loam are common in the C2 and C3 horizons at a depth of more than 40 inches. Reaction of the C horizon ranges from very strongly acid to neutral.

Hatliff Series

The Hatliff series consists of deep, nearly level, moderately well drained soils on flood plains. These soils are moderately rapidly permeable. They formed in loamy and sandy alluvial sediments. Slope is 0 to 1 percent. The soils of the Hatliff series are coarse-loamy, siliceous, nonacid, thermic Aquic Udifluvents.

Typical pedon of Hatliff fine sandy loam, frequently flooded; 8.3 miles north of Marquez on Farm Road 1146, and 0.9 mile west, in small clearing near a creek.

A—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; few fine distinct light gray (10YR 6/1) mottles; weak fine granular structure; hard, friable; common fine roots; slightly acid; clear smooth boundary.

C1—8 to 15 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure to structureless; hard, friable; common fine roots; slightly acid; clear smooth boundary.

C2—15 to 24 inches; pale brown (10YR 6/3) loamy fine sand; common yellowish brown (10YR 5/4) and light gray (10YR 7/1) stains and mottles; single grained; loose; very friable; neutral; clear smooth boundary.

C3—24 to 72 inches; yellowish brown (10YR 5/4) fine sandy loam; common fine distinct light gray (10YR 6/1, 7/1) mottles; structureless; loose, friable; neutral.

Bedding planes are evident and strata of contrasting textures are throughout the soil. Clay content in the 10- to 40-inch control section ranges from 8 to 18 percent.

The A horizon is brown, dark brown, or grayish brown. Reaction ranges from strongly acid to slightly acid. This horizon is 6 to 14 inches thick.

The C1 horizon is grayish brown, brown, or yellowish brown. In some places, it has mottles in shades of brown and red. The texture is fine sandy loam, sandy loam, or loamy fine sand. Reaction ranges from strongly acid to slightly acid.

The C2 horizon is light yellowish brown, pale brown, light gray, and gray with varying sizes and amounts of mottles in shades of red, brown, yellow, and gray. The texture is fine sandy loam, sandy loam, or loamy fine sand. Reaction ranges from strongly acid to neutral.

The C3 horizon is light yellowish brown, yellowish brown, or gray with varying amounts of mottles in shades of brown and gray. The texture is fine sandy loam with strata of loam, clay loam, and loamy fine sand. Reaction ranges from strongly acid to neutral.

Hearne Series

The Hearne series consists of deep, gently sloping to moderately steep, well drained soils on uplands. These soils are slowly permeable. They formed in acid, stratified loamy and shaly sediment. Slope ranges from 1 to 20 percent. The soils of the Hearne series are clayey, mixed, thermic Typic Haplustults.

Typical pedon of Hearne fine sandy loam, 5 to 20 percent slopes; from Texas Highway 7 in Marquez, 0.4 mile north on U.S. Highway 79, 3.1 miles north on Farm Road 1146, and 50 feet east, in pasture.

A—0 to 3 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; few rounded ironstone pebbles; common fine and few medium roots; strongly acid; clear smooth boundary.

E—3 to 6 inches; pale brown (10YR 6/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; few rounded ironstone pebbles; common fine roots; strongly acid; clear smooth boundary.

Bt1—6 to 15 inches; yellowish red (5YR 4/6) clay; moderate medium angular and subangular blocky structure; very hard, very firm; few ironstone pebbles in upper part; common fine roots; continuous clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—15 to 26 inches; yellowish red (5YR 4/6) clay; common medium prominent light gray (10YR 7/1) mottles and few medium distinct red (2.5YR 5/6) mottles; moderate medium subangular blocky structure; hard, firm; few stratified shale and sandstone fragments in lower part; few fine roots; patchy clay films on faces of peds; few flakes of mica; very strongly acid; gradual smooth boundary.

C—26 to 70 inches; stratified yellowish red (5YR 5/6), light gray (10YR 7/2), and reddish yellow (7.5YR 6/6) weakly cemented sandstone and shale; hard, firm; common fine flakes of mica; very strongly acid.

The solum ranges from 20 to 40 inches in thickness.

The A horizon is pale brown, brown, and light brown. The texture is fine sandy loam, gravelly fine sandy loam, and stony fine sandy loam. Ironstone fragments range from 1 to 45 percent, by volume. Reaction ranges from strongly acid to slightly acid. The A horizon is 3 to 8 inches thick.

The E horizon is pale brown and very pale brown. The texture and reaction are the same as those of the A horizon. The E horizon is 0 to 4 inches thick.

The Bt horizon is red and yellowish red with red, yellow, and gray mottles. The gray mottles are inherited from the parent material. The texture is clay or sandy clay, and the clay content is 35 to 45 percent. Reaction ranges from extremely acid to strongly acid. Base saturation at 50 inches below the top of the Bt horizon ranges from 15 to 35 percent.

Some pedons have a BC horizon that is red and yellowish red with red, yellow, and gray mottles. The texture is clay loam and clay. Reaction is very strongly acid.

The C horizon is stratified or interbedded sandstone and shale of varying shades of red, yellow, and gray. The amount of sandstone or shaly material is variable, and either may be absent in some pedons. Few to common flakes of mica are visible mostly along cleavage planes between strata. Reaction ranges from extremely acid to strongly acid.

Jedd Series

The Jedd series consists of moderately deep, strongly sloping to steep, well drained soils on uplands. These soils are moderately slowly permeable. They formed in marine sediment high in glauconite. Slope ranges from 8 to 25 percent. The soils of the Jedd series are fine, mixed, thermic Ultic Paleustalfs.

The Jedd soils in this survey area are considered a taxadjunct to the Jedd series because the Cr horizon is less acid than typical for the series and in places the base saturation is more than 75 percent in the argillic horizon. The surface layer is also thinner than typical for the series. Behavior, use, and management of these soils are similar to that of other Jedd soils.

Typical pedon of Jedd gravelly sandy loam, in an area of Jedd-Margie complex, 5 to 25 percent slope, 13 miles west of Centerville on Texas Highway 7, 3 miles south on Farm Road 1147, 2.8 miles south and southeast on a county road, and 1,500 feet southwest, on wooded, steep side slope.

A—0 to 3 inches; brown (10YR 5/3) gravelly sandy loam; weak fine subangular blocky structure; slightly hard, very friable; about 20 percent, by volume, angular sandstone fragments; fine and medium roots; neutral; clear smooth boundary.

Bt1—3 to 18 inches; yellowish red (5YR 4/6) clay; moderate medium subangular blocky structure; very hard, firm; common fine and medium roots; clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt2—18 to 28 inches; mottled yellowish red (5YR 4/6) and yellowish brown (10YR 5/8) clay; moderate medium subangular blocky structure; very hard, firm; few medium roots; clay films on faces of peds; very strongly acid; gradual smooth boundary.

BC—28 to 34 inches; strong brown (7.5YR 5/8) clay; common medium distinct yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; very hard, firm; masses of weathered glauconitic material; strongly acid; gradual wavy boundary.

Cr—34 to 60 inches; yellowish brown (10YR 5/6) weathered glauconitic material and glauconitic greensand; massive; neutral.

The solum is 20 to 40 inches thick. Base saturation in the argillic horizon is 65 to 85 percent.

The A horizon is dark brown, brown, pale brown, or reddish brown. Sandstone fragments range from 15 to 35 percent, by volume. Reaction is medium acid to neutral. The A horizon is 2 to 7 inches thick. A thin E horizon that is lighter in color than the A horizon is in some pedons.

The Bt horizon is dark red, red, reddish brown, or yellowish red. The texture is clay. Clay content is 40 to 55 percent. Reaction is very strongly acid to medium acid.

The BC horizon is red, reddish yellow, or strong brown. The texture is clay or clay loam with masses of yellowish, partly weathered glauconite. Reaction is very strongly acid to slightly acid. Some pedons do not have a BC horizon.

The C horizon is yellowish or brownish weathered glauconitic material or glauconitic greensand that has interbedded ledges of ironstone. Reaction is strongly acid to moderately alkaline.

Kaufman Series

The Kaufman series consists of deep, nearly level, somewhat poorly drained soils on bottom lands. These soils are very slowly permeable. They formed in alkaline clayey alluvium (fig. 24). Slope is mostly less than 1 percent, but it ranges up to 3 percent. The soils of the Kaufman series are very-fine, montmorillonitic, thermic Typic Pelluderts.

Typical pedon of Kaufman clay, occasionally flooded, from U.S. Highway 79 in Oakwood, 0.4 mile southeast on Farm Road 542, 3.1 miles northeast on a county road, 2.5 miles southeast on county road and private road, 400 feet north across crossing on oxbow lake, 2 miles east on a farm road, 0.7 mile southeast on a farm road, and 65 feet northeast, on bottom land.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay; moderate medium subangular blocky structure; extremely hard, very firm, sticky and plastic; common fine roots; slightly acid; clear smooth boundary.

A—8 to 70 inches; black (10YR 2/1) clay; moderate coarse blocky structure; extremely hard, very firm, sticky and plastic; few fine roots; common intersecting slickensides 2 to 5 inches across; slightly acid; diffuse wavy boundary.

Bg—70 to 80 inches; dark gray (10YR 4/1) clay; common medium distinct light olive brown (2.5Y 5/6) mottles; moderate medium blocky structure; extremely hard, very firm, sticky and plastic; common intersecting slickensides 2 to 5 inches across; few fine and medium calcium carbonate concretions; moderately alkaline.

The Kaufman soils are medium acid to moderately alkaline. Some pedons are calcareous below a depth of 24 inches. Intersecting slickensides begin about 22 inches below the surface. Cracks appearing on the surface are about 1 to 4 inches wide and extend to a depth of about 30 inches. Undisturbed areas have gilgai microrelief with microknolls 2 to 6 inches higher than microdepressions.

The A horizon is black or very dark gray. In some pedons, it has few to common fine mottles of yellowish brown or strong brown. The 10- to 40-inch control section has clay content ranging from 60 to 80 percent.

The Bg horizon is dark gray or very dark gray. In some pedons, it has few to common calcium carbonate concretions and mottles of olive, light olive brown, or yellowish brown.

Kirvin Series

The Kirvin series consists of deep, gently sloping, well drained soils on uplands (fig. 25). These soils are moderately slowly permeable. They formed in thick stratified sandstone and clayey shale sediments. Slope ranges from 1 to 5 percent. The soils of the Kirvin series are clayey, mixed, thermic Typic Hapludults.

Typical pedon of Kirvin fine sandy loam, 1 to 5 percent slopes; from Centerville, 11.1 miles north on Texas Highway 75, 1 mile east on Farm Road 831, 1.1 miles south on a county road, and 40 feet west of gate.

A—0 to 5 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; soft, very friable; many roots; few ironstone pebbles; medium acid; clear smooth boundary.

E—5 to 9 inches; pale brown (10YR 6/3) fine sandy loam; weak fine granular structure; soft, very friable; many fine roots; few ironstone pebbles; medium acid; abrupt smooth boundary.

Bt1—9 to 22 inches; red (2.5YR 4/6) clay; strong medium subangular blocky structure; very hard, very firm; common fine roots; thick continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—22 to 45 inches; red (2.5YR 4/6) clay; moderate medium angular and subangular blocky structure; extremely hard, extremely firm; common fine roots; thick continuous clay films on faces of peds; common light brownish gray shale fragments below a depth of 32 inches; very strongly acid; gradual wavy boundary.

BC—45 to 60 inches; light gray (10YR 7/2) clay; common medium prominent red (2.5YR 4/6) mottles and few fine faint yellowish brown mottles; weak moderate angular blocky structure; very hard, very firm; very strongly acid; gradual wavy boundary.

C—60 to 80 inches; light brownish gray (10YR 6/2) clayey shale; massive; very hard, very firm; very strongly acid.

The solum ranges from 40 to 60 inches in thickness.

The A horizon is dark grayish brown or brown. The texture is fine sandy loam or gravelly fine sandy loam. Ironstone pebbles range from 5 to 20 percent, by volume. Reaction ranges from strongly acid to slightly acid. The A horizon is 3 to 8 inches thick.

The E horizon is brown, yellowish brown, or pale brown. The texture is fine sandy loam and gravelly fine sandy loam. Ironstone pebbles range from 5 to 20 percent, by volume. Reaction ranges from strongly acid to slightly acid. The E horizon is 1 to 7 inches thick.

The Bt1 and Bt2 horizons are red, reddish brown, or yellowish red. The texture is clay in the Bt1 horizon and clay or sandy clay in the the Bt2 horizon. Few to common mottles in shades of yellow and brown are in some pedons. Reaction ranges from extremely acid to strongly acid. Gray shale fragments are in the lower part of some pedons.

The BC horizon is mottled light gray, reddish brown, yellowish red, or red. The texture is sandy clay loam, clay loam, or clay. Mottles in shades of yellow, brown, and gray range from few to common. Reaction is extremely acid or very strongly acid.

The C horizon is brown, red, or gray and is generally interbedded or thickly stratified sandstone and shale along with partly weathered, loamy soil material. Reaction is extremely acid or very strongly acid.

Larue Series

The Larue series consists of deep, gently sloping to strongly sloping, well drained soils on uplands. These soils are moderately permeable. They formed in sandy and loamy marine sediments. Slope ranges from 1 to 8 percent. The soils of the Larue series are loamy, siliceous, thermic Arenic Paleudalfs.

Typical pedon of Larue loamy fine sand, 1 to 8 percent slopes; 6.4 miles east of Texas Highway 75 in Centerville on Texas Highway 7, 150 feet south of Texas Highway 7, and 300 feet east of Farm Road 811, in pasture.

A—0 to 7 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; soft, very friable; many fine roots; medium acid; clear smooth boundary.

E—7 to 26 inches; very pale brown (10YR 7/4) loamy fine sand; single grained; loose; common fine roots; slightly acid; gradual smooth boundary.

Bt1—26 to 44 inches; yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, friable; few fine roots; discontinuous clay films on faces of peds; common fine pores; medium acid; gradual smooth boundary.

Bt2—44 to 80 inches; red (2.5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; hard, friable; discontinuous clay films on faces of peds; common fine pores; strongly acid.

The solum ranges from 60 to more than 80 inches in thickness.

The A horizon is dark brown, brown, or pale brown. The E horizon is brown, strong brown, light yellowish brown, pale brown, or very pale brown. The reaction of the A and E horizons is medium acid or slightly acid. Combined thickness of these horizons is 20 to 40 inches.

The Bt horizon is red or yellowish red. In some pedons, the lower part of the Bt horizon has mottles in shades of red, yellow, and brown. The texture of the upper part of the Bt horizon is sandy clay loam with clay content ranging from 20 to 30 percent. It is sandy clay loam, loam, and clay loam in the lower part. Some pedons have a few pockets of uncoated sand grains in the lower part. The reaction of the Bt horizon ranges from strongly acid to slightly acid. Base saturation, 50 inches below the top of the Bt horizon, ranges from 35 to 70 percent.

Lexton Series

The Lexton series consists of deep, gently sloping, well drained soils on uplands. These soils are moderately slowly permeable. They formed in marine sediment high in glauconite. Slope ranges from 1 to 3 percent. The soils of the Lexton series are fine, mixed, thermic Udic Haplustalfs.

Typical pedon of Lexton clay loam, 1 to 3 percent slopes, from Texas Highway 7 in Centerville, 1.8 miles south on access road on west side of Interstate 45, 0.6 mile west on a county road, and 75 feet north, in pasture.

A—0 to 7 inches; dark reddish brown (2.5YR 3/4) clay loam; moderate medium granular and subangular blocky structure; hard, firm; many fine roots; slightly acid; clear smooth boundary.

Bt1—7 to 17 inches; dark reddish brown (2.5YR 3/4) clay; moderate medium angular and subangular blocky structure; hard, firm; common fine roots; common distinct clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—17 to 42 inches; dark red (2.5YR 3/6) clay; moderate medium angular and subangular blocky structure; hard, firm; few fine roots; common distinct clay films on faces of peds; medium acid; gradual smooth boundary.

BC—42 to 57 inches; dark red (2.5YR 3/6) clay; moderate medium subangular blocky structure; hard, firm; few patchy clay films; common fine fragments of weathered glauconitic material; medium acid; gradual smooth boundary.

C—57 to 80 inches; reddish brown (5YR 4/4) clay; weathered yellowish brown (10YR 5/8) glauconitic material; massive; hard, firm; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. Ironstone fragments range from none to about 10 percent, by volume.

The A horizon is dark reddish brown or yellowish red. Reaction ranges from medium acid to neutral. The A horizon is 4 to 10 inches thick.

The Bt horizon is dark reddish brown, dark red, or red. The texture is clay or clay loam with an average clay content of 35 to 55 percent in the control section. Reaction is strongly acid to slightly acid.

The BC horizon is dark red, red, or yellowish red. Mottles in shades of red, brown, or yellow range from none to many. The texture is clay or clay loam. Reaction is medium acid or slightly acid.

The C horizon is mottled in shades of brown, yellow, or olive. It is weathered glauconitic material, glauconitic greensand, or clay and clay loam. Some pedons contain marine shell fragments. Reaction ranges from medium acid to mildly alkaline.

Lufkin Series

The Lufkin series consists of deep, nearly level, somewhat poorly drained soils on uplands. These soils are very slowly permeable. They formed in slightly acid to alkaline clayey sediment. Slope is 0 to 1 percent. The soils of the Lufkin series are fine, montmorillonitic, thermic Vertic Albaqualfs.

Typical pedon of Lufkin fine sandy loam, 0 to 1 percent slopes; from Texas Highway 7 in Marquez, 0.8 mile south on U.S. Highway 79, 0.7 mile southwest on a private road, and 15 feet northwest, in pasture.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine granular structure; hard, friable; common fine roots; few fine pores; medium acid; abrupt wavy boundary.

Btg1—6 to 35 inches; gray (10YR 5/1) clay; many coarse faint grayish brown (10YR 5/2) mottles and few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few fine pores; vertical cracks 2 millimeters wide filled with fine sandy loam; clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg2—35 to 48 inches; gray (10YR 5/1) clay; common coarse faint grayish brown (2.5Y 5/2) mottles; moderate medium angular blocky structure; extremely hard, very firm; vertical cracks 2 millimeters wide filled with fine sandy loam; clay films on faces of peds; neutral; gradual wavy boundary.

Btyg—48 to 60 inches; light gray (10YR 6/1) clay; common medium distinct yellowish red (5YR 4/6) mottles and many coarse faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; extremely hard, very firm; clay films on faces of peds; common gypsum crystals; slightly acid; gradual wavy boundary.

BCyg—60 to 72 inches; gray (10YR 5/1) clay; many coarse prominent red (2.5YR 4/6) mottles; massive; extremely hard, very firm; common gypsum crystals; medium acid.

The solum ranges from 40 to 65 inches in thickness.

The A horizon is dark grayish brown, very dark grayish brown, grayish brown, or gray. It is massive and hard when dry but has weak granular structure when moist. Reaction is strongly acid to slightly acid. The A horizon is 2 to 7 inches thick.

Some pedons have an E horizon that is gray, grayish brown, light gray, or light brownish gray. Reaction is strongly acid to slightly acid. The E horizon is 2 to 8 inches thick.

The Btg horizon is dark gray, gray, dark grayish brown, grayish brown, light gray, or light brownish gray. In some pedons, it has mottles in shades of brown, olive, and yellow. Reddish mottles are below a depth of 40 inches in some places. Clay content is 40 to 60 percent. Reaction is very strongly acid to mildly alkaline.

The BC horizon and Cg horizon are in various shades of gray with red, yellow, or brown mottles. Most pedons contain concretions of calcium carbonate and gypsum crystals. Reaction ranges from medium acid to moderately alkaline. Some pedons do not have a BC or a Cg horizon.

Lummus Series

The Lummus series consists of deep, gently sloping, moderately well drained soils on uplands. These soils are slowly permeable. They formed in interbedded sandy and clayey unconsolidated sediments. Slope ranges from 1 to 5 percent. The soils of the Lummus series are fine, mixed, thermic Aquic Glossudalfs.

Typical pedon of Lummus fine sandy loam, 1 to 5 percent slopes, from Texas Highway 7 in Centerville, 11.3 miles north on Texas Highway 75, 1.3 miles east on Farm Road 831, and 150 feet south, in pasture.

Ap—0 to 8 inches; dark brown (10YR 4/3) fine sandy loam; weak medium granular structure; soft, very friable; common fine and medium roots; slightly acid; clear smooth boundary.

E—8 to 24 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak medium granular structure; soft, very friable; common fine and medium roots; slightly acid; gradual wavy boundary.

B/E—24 to 27 inches; brownish yellow (10YR 6/6) sandy clay loam; common fine faint light gray mottles; about 20 percent tongues of light yellowish brown (10YR 6/4) fine sandy loam; moderate medium subangular blocky structure; slightly hard, friable; common fine roots; few patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt1—27 to 51 inches; light gray (10YR 6/1) clay; many medium prominent dark red (2.5YR 3/6) mottles and common fine distinct brownish yellow (10YR 6/6) mottles; moderate medium angular and subangular blocky structure; very hard, very firm; common fine roots; few fine pores; continuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—51 to 75 inches; light brownish gray (10YR 6/2) clay loam; common coarse prominent red (2.5YR 4/8) mottles and few fine distinct yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; very hard, firm; few fine roots; few fine pores; few fine flakes of mica; clay films on faces of peds; very strongly acid; gradual wavy boundary.

BC—75 to 80 inches; light gray (10YR 7/2) sandy clay loam; common medium distinct yellow (10YR 7/6) and red (2.5YR 4/8) mottles; weak fine subangular blocky structure; hard, firm; few fine flakes of mica; very strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. Average clay content in the upper 20 inches of the argillic horizon is 35 to 60 percent.

The A horizon is dark grayish brown, dark brown, brown, or yellowish brown. Reaction ranges from strongly acid to slightly acid. The A horizon is 5 to 11 inches thick.

The E horizon is light yellowish brown, pale brown, or very pale brown. Some pedons have a few brownish yellow mottles. Reaction ranges from strongly acid to slightly acid. The E horizon is 11 to 26 inches thick.

The B part of the B/E horizon is yellowish brown, brownish yellow, or yellow. Some pedons have a few red mottles. The texture is sandy clay loam or clay loam. The tongues of E material are light brownish gray, light yellowish brown, light gray, or very pale brown. The texture is fine sandy loam or loam. Reaction of the B/E horizon ranges from strongly acid to slightly acid. The B/E horizon is 2 to 7 inches thick.

The Bt1 horizon is light brownish gray, gray, grayish brown, or light gray. It has few to many mottles in shades of red and yellow. In some pedons, the matrix is mottled in shades of red, gray, and yellow. The texture is clay or sandy clay. Reaction ranges from very strongly acid to medium acid.

The Bt2 horizon is light brownish gray, grayish brown, light gray, or light brownish gray. It has few to many mottles in shades of red, yellow, and brown. The texture is clay, sandy clay, or sandy clay loam. Reaction ranges from very strongly acid to medium acid.

The BC horizon is light brownish gray and light gray. It has few to many mottles in shades of red, gray, and yellow. The texture ranges from sandy clay loam to clay with stratification of shale and sandstone. Reaction typically ranges from very strongly acid to medium acid, but in some pedons, it ranges to mildly alkaline.

Mabank Series

The Mabank series consists of deep, nearly level, somewhat poorly drained soils on uplands. These soils are very slowly permeable. They formed in alkaline marine clays and shales. Slope is 0 to 1 percent. The soils of the Mabank series are fine, montmorillonitic, thermic Vertic Albaqualfs.

Typical pedon of Mabank fine sandy loam, 0 to 1 percent slopes; from Texas Highway 7 in Marquez, 0.8 mile south on U.S. Highway 79, 0.2 mile southwest on a private road, and 30 feet northwest, in pasture.

A—0 to 6 inches; grayish brown (10YR 5/2) fine sandy loam; weak fine granular structure; very hard, friable; medium acid; abrupt wavy boundary.

Btg1—6 to 23 inches; black (10YR 2/1) clay; moderate medium angular blocky structure; extremely firm; grayish brown material from A horizon in vertical cracks; continuous clay films on faces of peds; medium acid; gradual smooth boundary.

Btg2—23 to 36 inches; very dark gray (10YR 3/1) clay; moderate medium angular blocky structure; extremely hard, extremely firm; common clay films on faces of peds; moderately alkaline; gradual smooth boundary.

Btyg—36 to 44 inches; very dark gray (10YR 3/1) clay; few fine faint brownish yellow (10YR 6/8) mottles; moderate medium subangular blocky structure; extremely hard, extremely firm; many gypsum crystals; patchy clay films on faces of peds; slightly acid; gradual smooth boundary.

BCy—44 to 72 inches; gray (10YR 5/1) clay; many medium distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; extremely hard, very firm; many gypsum crystals; medium acid.

The solum ranges from 60 to more than 80 inches in thickness. Depth to gypsum crystals is 30 to 50 inches.

The A horizon is grayish brown or light brownish gray. It is massive and hard when dry but has weak granular structure when moist. Reaction ranges from medium acid to neutral. The A horizon is 4 to 10 inches thick.

The upper part of the Btg horizon is black or very dark gray. The texture is clay, and the reaction is medium acid. The lower part of the Btg horizon and the Btyg horizon are very dark gray or dark gray and contain mottles in shades of yellow and brown. Reaction ranges from slightly acid to moderately alkaline. Gypsum crystals are in the Btyg horizon.

The BCy horizon is gray or grayish brown with mottles in shades of yellow and brown. The texture is mainly clay but ranges to silt loam. Gypsum crystals are in this horizon.

Margie Series

The Margie series consists of deep, gently sloping to strongly sloping, well drained soils on uplands. These soils are moderately slowly permeable. They formed in marine sediment high in glauconite. Slope ranges from 1 to 8 percent. The soils of the Margie series are fine, mixed, thermic Udic Paleustalfs.

Typical pedon of Margie fine sandy loam, 1 to 5 percent slopes; from U.S. Highway 79 in Marquez, 4 miles east on Texas Highway 7, 3 miles south on Farm Road 1147 to the old Bowling Community, 0.4 mile south on a county road, 0.5 mile southwest on field road, and 400 feet east, in an old cultivated field.

A—0 to 10 inches; dark reddish brown (5YR 3/4) fine sandy loam; weak fine granular structure; slightly hard, friable; many fine and medium roots; common fine and medium pores; few ironstone pebbles; slightly acid; clear smooth boundary.

BA—10 to 14 inches; dark red (2.5YR 3/6) sandy clay loam; moderate medium subangular blocky structure; hard, very firm; common fine roots; common fine pores; slightly acid; clear smooth boundary.

Bt1—14 to 27 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; very hard, very firm; few fine roots; common fine pores; few ironstone pebbles; few clay films on faces of peds;

slightly acid; gradual wavy boundary.

Bt2—27 to 46 inches; dark red (2.5YR 3/6) very gravelly sandy clay; moderate medium subangular blocky structure; very hard, very firm; few fine roots; few fine pores; 45 to 50 percent ironstone gravel 5 to 15 millimeters in diameter; clay films on face of peds; slightly acid; gradual wavy boundary.

Bt3—46 to 63 inches; red (2.5YR 4/8) sandy clay loam; moderate medium subangular blocky structure; very hard, very firm; few fine roots; few fine pores; few ironstone pebbles; clay films on faces of peds; medium acid; diffuse wavy boundary.

BC—63 to 70 inches; red (2.5YR 4/8) fine sandy loam and weakly cemented yellowish red (5YR 5/8) sandstone; weak medium subangular blocky structure; hard, firm; few fine roots; medium acid; clear smooth boundary.

C—70 to 80 inches; dark red (2.5YR 3/6) stratified shale, weakly cemented sandstone, and weathered glauconitic material; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) layers 1 to 2 centimeters thick; massive; hard, firm; strongly acid.

The solum ranges from 40 to more than 60 inches in thickness. Ironstone pebbles range from a few to 35 percent throughout the soil.

The A horizon is dark reddish brown, reddish brown, or red. The texture is fine sandy loam or loam. Reaction is medium acid to neutral. The A horizon is 2 to 11 inches thick.

The BA horizon is dark reddish brown, reddish brown, dark red, red, or yellowish red. The texture is sandy clay loam. Reaction is medium acid to neutral.

The Bt horizon is dark red, red, or yellowish red. It has common yellowish brown and brownish yellow mottles in the lower part. The texture is sandy clay or clay in the upper part and grades to sandy clay loam in the lower part. In the upper part of this horizon, the average clay content is 35 to 50 percent. Reaction is strongly acid to slightly acid. In some pedons, the Bt horizon commonly has up to 50 percent ironstone fragments.

The BC horizon is red, yellowish red, brownish yellow, or strong brown. It has red or brownish mottles. Reaction is medium acid or slightly acid.

The C horizon is yellowish brown, yellowish red, red, dark red, or brown shale and sandstone with glauconitic greensand or fragments of weathered glauconitic material. Siliceous pebbles and ferromanganese concretions are common. Reaction ranges from strongly acid to mildly alkaline.

Marquez Series

The Marquez series consists of deep, gently sloping, well drained soils on uplands (fig. 26). These soils are slowly permeable. They formed in acid stratified loamy and clayey sediments. Slope ranges from 1 to 5 percent. The soils of the Marquez series are clayey, mixed, thermic Typic Haplustults.

Typical pedon of Marquez very fine sandy loam, 1 to 5 percent slopes; from the intersection of U.S. Highway 79 and a county road in Jewett, 2.3 miles northwest and north on the county road, 0.5 mile east and 400 feet south on a private road, and 50 feet east, in pasture.

A—0 to 7 inches; dark yellowish brown (10YR 4/4) very fine sandy loam; weak fine granular structure; slightly hard, friable; many fine roots; few ironstone pebbles; very strongly acid; clear smooth boundary.

E—7 to 13 inches; brownish yellow (10YR 6/6) very fine sandy loam; weak fine granular structure; slightly hard, friable; common fine roots; common fine pores; few ironstone pebbles; strongly acid; clear smooth boundary.

Bt1—13 to 24 inches; yellowish red (5YR 4/8) clay; moderate medium angular blocky structure; firm, hard; few fine roots; common medium pores; clay films on faces of peds; few ironstone pebbles; strongly acid; clear smooth boundary.

Bt2—24 to 42 inches; mottled yellowish red (5YR 5/8) and red (2.5YR 4/8) clay; moderate medium angular blocky structure; hard, firm; few fine roots; clay films on faces of peds; strongly acid; gradual smooth boundary.

BC—42 to 50 inches; mottled red (2.5YR 4/6), light brownish gray (10YR 6/2), and yellowish red (5YR 5/8) clay; weak medium angular blocky structure; firm, hard; few clay films on faces of peds; very strongly acid; gradual smooth boundary.

C—50 to 80 inches; mottled red (2.5YR 4/8) and light gray (10YR 7/2) stratified silty clay and sandstone that can be cut with spade; few fine flakes of mica; very strongly acid.

The solum ranges from 40 to 60 inches in thickness.

The A horizon is dark brown, brown, grayish brown, or dark yellowish brown. The texture is very fine sandy loam or gravelly fine sandy loam. The gravel content of the A horizon ranges from less than 1 percent to as much as 35 percent. Reaction is slightly acid to very strongly acid. The A horizon is 3 to 8 inches thick.

The E horizon is brown, light brown, brownish yellow, or reddish yellow. The texture and reaction are similar to those of the A horizon. The E horizon is 2 to 8 inches thick.

The Bt horizon is dark red, red, or yellowish red. The texture of the upper 20 inches of the Bt horizon is clay or clay loam. Reaction is strongly acid or very strongly acid.

The BC and C horizons are red, yellow, brown, and gray and are interbedded or stratified with textures ranging from sandy loam to clayey shale and sandstone. Reaction is strongly acid or very strongly acid. Base saturation is 15 to 35 percent at the contact between the BC and C horizons.

Melhomes Series

The Melhomes series consists of deep, nearly level, poorly drained soils that are rapidly permeable. They are in poorly defined drainageways and on lower slopes that are saturated for most of the year. These soils formed in thick beds of recent sandy colluvial sediment. Slope is 0 to 1 percent. The soils of the Melhomes series are siliceous, thermic Humaqueptic Psammaquents.

The Melhomes soils in the survey area are considered a taxadjunct to the series because they receive less annual rainfall than typical. Use and management of these soils are similar to that of other Melhomes soils.

Typical pedon of Melhomes loamy fine sand, 0 to 1 percent slopes; from U.S. Highway 79 in Marquez, 4.2 miles north on Farm Road 1146, and 1,600 feet northeast, in pasture on north side of sink hole.

A—0 to 10 inches; black (10YR 2/1) loamy fine sand; weak fine granular structure; very friable; many medium and fine roots; very strongly acid; gradual wavy boundary.

Ag—10 to 20 inches; dark gray (10YR 4/1) loamy fine sand; weak fine granular structure; very friable; very strongly acid; clear wavy boundary.

Cg—20 to 70 inches; light gray (10YR 7/1) loamy fine sand; single grained; loose; very strongly acid.

The solum ranges from 70 to more than 100 inches in thickness. Reaction is very strongly acid or strongly acid in all horizons.

The A horizon is black, very dark gray, or dark gray.

The Cg horizon is gray or light gray. The texture is loamy fine sand or fine sand.

Nahatche Series

The Nahatche series consists of deep, nearly level, somewhat poorly drained soils on bottom lands. These soils are moderately permeable. They formed in loamy alluvial sediment. The soils are subject to flooding about once every 2 years or more often. Slope is 0 to 1 percent. The soils of the Nahatche series are fine-loamy, siliceous, nonacid, thermic Aeric Fluvaquents.

Typical pedon of Nahatche loam, frequently flooded; 2.6 miles northwest on county road from its intersection with U.S. Highway 79 in Jewett and 0.5 mile northeast on a ranch road, on flood plain.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) loam; few medium faint dark gray (10YR 4/1) mottles; weak fine granular structure; hard, friable; many fine roots; neutral; clear smooth boundary.

Cg1—3 to 25 inches; dark grayish brown (10YR 4/2) loam; many medium distinct light brownish gray (10YR 6/2) and dark brown (10YR 4/3) mottles; weak fine granular structure; hard, friable; many fine roots; few fine pores; slightly acid; clear smooth boundary.

Cg2—25 to 43 inches; dark gray (N 4/0) clay loam; common medium distinct dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; very hard, very firm; few fine roots; neutral; clear smooth boundary.

Agb—43 to 48 inches; very dark gray (10YR 3/1) clay loam; few medium faint gray (10YR 5/1) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very hard, very firm; few fine roots; slightly acid; clear smooth boundary.

Cgb—48 to 72 inches; dark gray (10YR 4/1) clay loam; common medium distinct yellowish brown (10YR 5/8) mottles and few medium prominent red (2.5YR 4/8) mottles; massive; extremely hard, very firm; slightly acid.

The Nahatche soils generally range from medium acid to neutral, but in some pedons, they range to strongly acid in some subhorizons. The weighted average clay content of the 10- to 40-inch control section is 18 to 30 percent. Thin strata of sandier textures are common in most pedons.

The A horizon is brown, dark grayish brown, or very dark grayish brown. In some pedons, it has mottles in shades of gray and brown. The A horizon is less than 10 inches thick.

The Cg horizon is dark grayish brown, light brownish gray, dark gray, and gray. It has mottles in shades of brown, yellow, and red. Stratified layers of loam, silt loam, sandy clay loam, clay loam, or silty clay loam are common, as well as thin layers of sandier textures. Buried horizons below a depth of 40 inches are also common.

Nugent Series

The Nugent series consists of deep, nearly level, excessively drained soils on bottom lands. These soils are moderately rapidly permeable. They formed in recent sandy alluvium. These soils are subject to flooding about once in 3 to 5 years. Slope is mostly less than 1 percent, but it ranges up to 2 percent. The soils of the Nugent series are sandy, siliceous, thermic Typic Udifluvents.

The Nugent soils in this survey area are considered taxadjuncts to the Nugent series because they have higher chromas than typical and contain mottles in the lower part of the C horizon. These soils also receive less precipitation than typical for the series. Use and behavior of these soils are similar to that of other Nugent soils.

Typical pedon of Nugent loamy fine sand, occasionally flooded, 4.9 miles north of Flo on Farm Road 831, 0.7 mile southeast on a private road, 0.2 mile southwest on farm trail, and 2,000 feet south on farm trail, on flood plain.

A—0 to 16 inches, dark brown (10YR 4/3) loamy fine sand; weak fine granular structure; soft, very friable; common fine roots; very strongly acid; clear smooth boundary.

C1—16 to 33 inches, brownish yellow (10YR 6/6) loamy fine sand; single grained; loose; very strongly acid; clear smooth boundary.

C2—33 to 60 inches, mottled yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) loamy fine sand; few fine distinct light gray (10YR 7/2) mottles; single grained; loose; strongly acid; clear smooth boundary.

C3—60 to 80 inches, mottled brownish yellow (10YR 6/8), strong brown (7.5YR 5/8), very pale brown (10YR 7/3), and light brownish gray (10YR 6/2) loamy fine sand; single grained; loose; very strongly acid.

The Nugent soils are very strongly acid to slightly acid. They are loamy fine sand, loamy sand, or fine sand. Some pedons have thin strata of loamy very fine sand or finer textured material. A high water table is at a depth of 4 to 6 feet in some pedons.

The A horizon is grayish brown, brown, dark brown, or light brownish gray.

The C horizon is yellowish brown, brownish yellow, strong brown, brown, dark brown, pale brown, very pale brown, or light brownish gray. Mottles in shades of brown, yellow, and gray occur in various sizes and abundance in the lower part of this horizon.

Oakwood Series

The Oakwood series consists of deep, gently sloping, moderately well drained soils on uplands. These soils are moderately slowly permeable. They formed in thick beds of unconsolidated loamy sediment. Slope ranges from 1 to 5 percent. The soils of the Oakwood series are fine-loamy, siliceous, thermic Plinthic Paleudalfs.

Typical pedon of Oakwood fine sandy loam, 1 to 5 percent slopes, 5.1 miles southeast of Leona on Farm Road 977, 0.9 mile south and east on a county road, and 0.65 mile northwest of county road, in forest.

A—0 to 5 inches, light yellowish brown (10YR 6/4) fine sandy loam; weak medium granular structure; soft, very friable; slightly acid; clear smooth boundary.

E—5 to 19 inches, very pale brown (10YR 7/4) fine sandy loam; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

Bt1—19 to 27 inches, brownish yellow (10YR 6/6) sandy clay loam; few fine faint strong brown mottles; moderate medium subangular blocky structure; hard, firm; common clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—27 to 39 inches, brownish yellow (10YR 6/8) sandy clay loam; common fine prominent red (2.5YR 4/8) mottles and common fine faint yellowish brown mottles; moderate medium subangular blocky structure; hard, firm; common clay films on faces of peds; strongly acid; gradual smooth boundary.

Btv—39 to 80 inches, brownish yellow (10YR 6/6) sandy clay loam; common medium prominent light gray (10YR 7/2) and red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; hard, firm; about 15 percent, by volume, nodular plinthite; few clay films on faces of peds; strongly acid.

The solum is more than 60 inches thick. Clay content of the upper 20 inches of the Bt horizon ranges from 20 to 35 percent. Plinthite ranges from 5 to 20 percent and is within 30 to 50 inches of the surface. Ironstone concretions range from none to 10 percent, by volume, throughout the solum.

The A horizon is dark grayish brown, dark brown, dark yellowish brown, brown, yellowish brown, or light yellowish brown. Reaction is medium acid to neutral. The A horizon is 2 to 10 inches thick.

The E horizon is brown, yellowish brown, light yellowish brown, pale brown, or very pale brown. Reaction is strongly acid to neutral. The E horizon is 3 to 15 inches thick. Combined thickness of the A and E horizon is 10 to 20 inches.

The Bt1 horizon is yellowish brown or brownish yellow. Mottles in shades of red and brown range from none to common. The texture is sandy clay loam or clay loam. Reaction is strongly acid to slightly acid.

The Bt2 horizon is yellowish brown or brownish yellow. Mottles range from few to many in shades of brown, red, or yellow. The texture is sandy clay loam. Reaction is very strongly acid to medium acid.

The Btv horizon is brownish yellow or yellowish brown with mottles, or it is mottled in shades of red, gray, or yellow. Interfingering or pockets of clean sand grains range from 1 to 5 percent, by volume. Chroma of 2 or less occurs more than 30 inches below the surface. The texture is sandy clay loam. Reaction is very strongly acid to medium acid.

Some pedons have a BC or a C horizon that is mottled in shades of red, gray, or yellow. Interfingering or pockets of clean sand grains range from 1 to 5 percent, by volume. The texture ranges from loamy fine sand to sandy clay loam. Some pedons have platy ironstone fragments or stratified shale. Reaction is very strongly acid to medium acid.

Padina Series

The Padina series consists of deep, gently sloping to moderately steep, moderately well drained soils on uplands. These soils are moderately slowly permeable. They formed in thick beds of sandy material. Slope ranges from 1 to 15 percent. The soils of the Padina series are loamy, siliceous, thermic Grossarenic Paleustalfs.

Typical pedon of Padina loamy fine sand, 1 to 8 percent slopes; from Farm Road 39 in Jewett, 1.8 miles west on U.S. Highway 79, 1.2 miles north on Farm Road 1512 to Newby, 4.85 miles west on Farm Road 1469, 0.17 mile southwest on a private road, and 50 feet east, in woodland.

A—0 to 5 inches; pale brown (10YR 6/3) loamy fine sand; weak fine granular structure and single grained; soft, loose; common fine and few medium roots; medium acid; clear smooth boundary.

E—5 to 58 inches; very pale brown (10YR 7/4) loamy fine sand; single grained; loose; few fine and medium roots in upper part; medium acid; clear smooth boundary.

Bt1—58 to 70 inches; yellowish brown (10YR 5/8) sandy clay loam; common medium distinct light brownish gray (10YR 6/2) mottles and common medium prominent red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, firm; thin patchy clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—70 to 80 inches; reticulately mottled yellowish red (5YR 5/8) and light gray (10YR 7/2) sandy clay loam; common medium distinct brownish yellow (10YR 6/8) mottles; weak medium subangular blocky structure; hard, firm; few thin patchy clay films on faces of peds; strongly acid.

The solum ranges from 70 to more than 80 inches in thickness.

The A horizon is pale brown, brown, yellowish brown, or dark brown. It is 4 to 20 inches thick. The E horizon is brownish yellow, very pale brown, or light yellowish brown. It is 35 to 76 inches thick. The A and E horizons are neutral to medium acid. Combined thickness is 40 to 80 inches.

The Bt horizon is yellowish brown, brownish yellow, reddish yellow, yellowish red, red, light brownish gray, and light gray with varying sizes and amounts of red, yellow, and gray mottles. The texture is sandy clay loam. The average clay content is 25 to 35 percent, but it ranges from 20 to 35 percent. Reaction ranges from strongly acid to slightly acid. Base saturation of the Bt horizon at a depth of 72 inches in the type location is 40 percent.

Pickton Series

The Pickton series consists of deep, gently sloping to moderately steep, well drained soils on uplands. These soils are moderately permeable. They formed in thick beds of sandy material. Slope ranges from 1 to 15 percent. The soils of the Pickton series are loamy, siliceous, thermic Grossarenic Paleudalfs.

Typical pedon of Pickton loamy fine sand, 1 to 8 percent slopes; 6 miles east of Centerville on Texas Highway 7, 1.6 miles northwest on a county road, 1.1 miles east on a private road, 1.4 miles northeast and east on a private road to transmission line right-of-way, and 0.2 mile north on a private road (by camphouse), in forest.

A—0 to 4 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; loose; common fine roots; slightly acid; clear smooth boundary.

E1—4 to 48 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose; common fine roots; medium acid; gradual smooth boundary.

E2—48 to 66 inches; very pale brown (10YR 7/4) loamy fine sand; single grained; loose; few fine roots;

medium acid; clear smooth boundary.

Bt1—66 to 75 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium prominent yellowish red (5YR 5/8) mottles and common medium distinct reddish yellow (7.5YR 6/8) mottles; weak medium subangular blocky structure; hard, friable; few clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—75 to 84 inches; yellowish red (5YR 5/8) sandy clay loam; common medium prominent light brownish gray (10YR 6/2) mottles and common medium distinct red (2.5YR 4/8) mottles; weak medium subangular blocky structure; hard, friable; few clay films on faces of peds; very strongly acid.

The solum ranges from 80 to more than 100 inches in thickness.

The A horizon is dark grayish brown, brown, yellowish brown, or pale brown. It is 4 to 10 inches thick. The E horizon is yellowish brown, light yellowish brown, or very pale brown. It is 35 to 76 inches thick. Reaction of the A and E horizons is medium acid to neutral. Combined thickness of these horizons is 40 to 80 inches.

The Bt horizon is light yellowish brown, yellowish brown, strong brown, yellowish red, or gray. It has mottles in shades of red, yellow, and gray in various amounts and sizes. The texture is sandy clay loam with a clay content of 20 to 30 percent. Reaction ranges from very strongly acid to slightly acid. Base saturation of the Bt horizon at a depth of 72 inches ranges from 55 to 75 percent.

Some pedons have a BC horizon that is mottled in shades of red, yellow, and gray. The texture is sandy clay loam or sandy loam. Reaction is similar to that of the Bt horizon.

Rader Series

The Rader series consists of deep, gently sloping and gently undulating, moderately well drained soils on terraces and uplands. These soils are very slowly permeable. They formed in slightly acid to alkaline clayey sediment interbedded with loamy material. Slope ranges from 1 to 3 percent. The soils of the Rader series are fine-loamy, mixed, thermic Aquic Paleustalfs.

Typical pedon of Rader fine sandy loam, 1 to 3 percent slopes; from U.S. Highway 79 in Jewett, 0.25 mile southeast on Farm Road 39, 300 feet east on a county road, 1.04 miles south on a county road, continue 0.6 mile south on right fork of county road, 0.2 mile southeast on a private trail to right-of-way, and 50 feet north on right-of-way.

A—0 to 6 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; many fine roots; slightly acid; clear smooth boundary.

E1—6 to 12 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; common fine roots; slightly acid; gradual smooth boundary.

E2—12 to 24 inches; pale brown (10YR 6/3) fine sandy loam; common medium faint brownish yellow (10YR 6/6) mottles; weak medium subangular blocky structure; slightly hard, very friable; common fine roots; slightly acid; gradual smooth boundary.

Bt/E—24 to 30 inches; bodies of yellowish brown (10YR 5/6) sandy clay loam (B part) with common pockets of light gray (10YR 7/1) fine sandy loam (E part); few medium faint yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; hard, friable; few fine roots; strongly acid; clear wavy boundary.

Bt1—30 to 42 inches; light brownish gray (10YR 6/2) sandy clay; many coarse distinct brownish yellow (10YR 6/8) mottles and common medium prominent red (2.5YR 4/8) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm; common clay films on faces of peds; few fine roots; very strongly acid; gradual smooth boundary.

Bt2—42 to 54 inches; light gray (10YR 7/2) clay; common medium distinct brownish yellow (10YR 6/6) mottles and common medium prominent red (2.5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; extremely hard, very firm; common clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt3—54 to 68 inches; light gray (10YR 7/1) clay; common medium prominent red (2.5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; extremely hard, very firm; small pockets of barium salts; neutral; clear wavy boundary.

BC—68 to 80 inches; mottled light gray (10YR 7/1), light yellowish brown (10YR 6/4), and dark red (2.5YR 3/6) sandy clay loam; weak medium subangular blocky structure; very hard, firm; moderately alkaline.

The solum is 60 to more than 80 inches thick. Clay content of the control section is 28 to 35 percent.

The A horizon is brown or yellowish brown. It is 4 to 10 inches thick. The E horizon is pale brown, light yellowish brown, or very pale brown. It is 10 to 25 inches thick. Reaction of the A and E horizons is strongly acid to slightly acid.

The Bt/E horizon is 70 to 85 percent Bt material. The Bt part is yellowish brown or brownish yellow. The texture is sandy clay loam or loam. The E part is light gray, light brownish gray, pale brown, or very pale brown. The texture is fine sandy loam or loam. This material occurs as coatings on peds and pockets with amounts decreasing in depth. Some pedons have mottles in shades of red and yellow that range from few to common. Reaction is very strongly acid or strongly acid.

The Bt1 and Bt2 horizons are gray, light brownish gray, or light gray. Mottles in shades of red, gray, brown, or yellow range from few to many. The texture is clay, sandy clay, or clay loam with a clay content of 35 to 50 percent. Reaction is very strongly acid or strongly acid. The Bt3 and BC horizons are generally mottled in shades of gray, yellow, brown, and red. The texture is clay, sandy clay, or sandy clay loam. Some pedons contain concretions and pockets of calcium carbonate and barium salts. Reaction is strongly acid to moderately alkaline.

Robco Series

The Robco series consists of deep, gently sloping to strongly sloping, moderately well drained soils on uplands and terraces (fig. 27). These soils are slowly permeable. They formed in loamy and clayey sediments. Slope ranges from 1 to 8 percent. The soils of the Robco series are clayey, mixed, thermic Aquic Arenic Paleustalfs.

Typical pedon of Robco loamy fine sand, 1 to 8 percent slopes; from the Limestone County line, 1.5 miles southeast on Farm Road 1512, 500 feet south on a private road, and 50 feet west, in pasture.

A1—0 to 7 inches; dark brown (10YR 4/3) loamy fine sand; weak fine granular structure; slightly hard, very friable; many fine roots; common very fine pores; strongly acid; clear smooth boundary.

A2—7 to 14 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; slightly hard; very friable; common fine roots; common very fine pores; medium acid; clear smooth boundary.

E—14 to 22 inches; pale brown (10YR 6/3) loamy fine sand; single grained; slightly hard, loose; common fine roots; common fine pores; common small black concretions; medium acid; clear smooth boundary.

B/E—22 to 25 inches; yellowish brown (10YR 5/4) sandy clay loam (B part); common fine faint yellowish brown (10YR 5/6) mottles; 30 percent, by volume, light brownish gray (10YR 6/2) loamy fine sand tongues and interfingers (E part); weak medium subangular blocky structure; slightly hard, friable; common fine roots; few fine pores; few patchy clay films on faces of peds; strongly acid; clear smooth boundary.

Bt1—25 to 34 inches; grayish brown (10YR 5/2) clay; many medium prominent red (2.5YR 4/6) mottles oriented as vertical streaks inside peds; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very hard, very firm; few fine roots; few fine pores; clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—34 to 55 inches; grayish brown (2/5YR 5/2) clay; common medium distinct yellowish brown (10YR 5/6) mottles and few medium prominent red (2.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very hard, very firm; few fine roots; few fine pores; clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt3—55 to 65 inches; light brownish gray (2.5Y 6/2) sandy clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; very hard, very firm; medium acid; gradual wavy boundary.

BC—65 to 80 inches; light brownish gray (2.5Y 6/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; hard; very firm; many mica flakes; neutral.

The solum ranges from 60 to more than 80 inches in thickness. Average clay content of the upper 20 inches of the argillic horizon is 35 to 60 percent.

The A horizon is dark brown, brown, or pale brown. The E horizon is brown, pale brown, very pale brown, or light yellowish brown. In some pedons, it has few to common mottles in shades of gray or yellow. Thickness of the loamy fine sand A and E horizons is 20 to 40 inches. Reaction in these horizons is slightly acid to strongly acid.

The B/E horizon is 60 to 90 percent, by volume, Bt material that is sandy clay loam, loam, or clay loam. The E material is loamy fine sand or fine sand. The Bt part is yellowish brown and brownish yellow. The tongues and interfingers of E material are light gray and very pale brown. Mottles are in shades of gray, yellow, or red. Reaction is medium acid to very strongly acid.

The Bt horizon is gray, grayish brown, light brownish gray, very pale brown, light gray, or light yellowish brown. Mottles in shades of red, yellow, brown, and gray range from few to many, or the matrix is mottled in shades of red, gray, and yellow. The texture is clay or sandy clay in the Bt1 and Bt2 horizons and ranges to clay loam and sandy clay loam, as well as clay and sandy clay in the Bt3 horizon. Reaction in the Bt horizon is very strongly acid to medium acid. Some pedons have interfingering and tonguing of E material in the lower part.

The BC horizon is in shades of red, gray, yellow, or brown and has few to many mottles. The texture is variable, ranging from sandy clay loam to clay. Reaction is very strongly acid to neutral. Some pedons do not have a BC horizon.

Silawa Series

The Silawa series consists of deep, gently sloping to strongly sloping, well drained soils on terraces and uplands. These soils are moderately permeable. They formed in sandy and loamy sediments. Slope ranges from 1 to 8 percent. The soils of the Silawa series are fine-loamy, siliceous, thermic Ultic Haplustalfs.

Typical pedon of Silawa fine sandy loam, 1 to 5 percent slopes; 0.4 mile north on U.S. Highway 79 in Marquez, 0.5 mile northwest on Farm Road 1146, 4.3 miles northwest on a county road, 0.3 mile southwest on county road to gate, and 1,500 feet northwest, in pasture.

A—0 to 7 inches; dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; slightly hard, very friable; medium acid; clear smooth boundary.

E—7 to 16 inches; yellowish brown (10YR 5/4) fine sandy loam; massive; slightly hard, very friable; medium acid; clear smooth boundary.

Bt1—16 to 40 inches; red (2.5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; common clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—40 to 55 inches; yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; few clay films on faces of peds; very strongly acid; gradual smooth boundary.

BC—55 to 70 inches; yellowish red (5YR 5/8) fine sandy loam; massive; soft, friable; very strongly acid; clear smooth boundary.

C—70 to 84 inches; strong brown (7.5YR 5/6) loamy fine sand; single grained; loose; very strongly acid.

The solum ranges from 40 to 70 inches in thickness.

The A horizon is dark brown, dark grayish brown, and yellowish brown. The E horizon is dark brown, brown, grayish brown, or yellowish brown. Reaction of these horizons ranges from strongly acid to slightly acid. Combined thickness is 4 to 20 inches.

The Bt horizon is red, yellowish red, or strong brown. The texture is sandy clay loam but ranges to clay loam in the upper part of the horizon. Clay content ranges from 20 to 35 percent. The reaction is very strongly acid to medium acid.

The BC horizon has colors similar to those of the Bt2 horizon. The texture is fine sandy loam, sandy loam, or loamy fine sand. Reaction ranges from very strongly acid to slightly acid.

The C horizon is in shades of red, brown, or yellow. The texture is loamy fine sand or fine sandy loam. Reaction ranges from strongly acid to slightly acid.

Silstid Series

The Silstid series consists of deep, gently sloping, well drained soils on uplands (fig. 28). These soils are moderately permeable. They formed in beds of sandy or loamy material and interbedded sandstones. Slope ranges from 1 to 5 percent. The soils of the Silstid series are loamy, siliceous, thermic Arenic Paleustalfs.

Typical pedon of Silstid loamy fine sand, 1 to 5 percent slopes; from Texas Highway 7 in Marquez, 0.4 mile north on U.S. Highway 79, 3.5 miles northwest on Farm Road 1146, and 100 feet west, in pasture.

A—0 to 6 inches; brown (10YR 5/3) loamy fine sand; weak fine granular structure; very friable, soft; common fine roots; slightly acid; clear smooth boundary.

E—6 to 24 inches; light yellowish brown (10YR 6/4) loamy fine sand; weak fine granular structure; very friable, soft; common fine roots; slightly acid; clear smooth boundary.

Bt1—24 to 46 inches; yellowish brown (10YR 5/6) sandy clay loam; few medium distinct yellowish red (5YR 5/6) mottles and few fine prominent red (2.5YR 4/6) mottles; moderate medium subangular blocky structure; very hard, friable; few fine roots; common clay films on faces of peds; medium acid; gradual wavy boundary.

Bt2—46 to 64 inches; brownish yellow (10YR 6/8) sandy clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very hard, friable; few fine roots; patchy clay films on faces of peds; medium acid; gradual wavy boundary.

Bt3—64 to 80 inches; yellow (10YR 7/8) fine sandy loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; slightly hard, friable; common medium very pale brown (10YR 7/3) pockets of uncoated sand; medium acid.

The solum ranges from 60 to more than 80 inches in thickness.

The A horizon is dark brown, brown, pale brown, yellowish brown, or light yellowish brown. The E horizon is light yellowish brown, very pale brown, or yellow. The A and E horizons combined range from 20 to 40 inches in thickness. Reaction is medium acid to neutral.

The Bt horizon is brownish yellow, yellowish brown, light yellowish brown, reddish yellow, or strong brown. Mottles in shades of red occur throughout the Bt horizon. In a few pedons, mottles in shades of gray are in the lower part of this horizon. Streaks or pockets of uncoated sand are also in the lower part of some pedons. The texture of the Bt horizon is sandy clay loam, loam, or fine sandy loam. Clay content is 18 to 32 percent. Reaction is slightly acid to strongly acid.

Some pedons have a C horizon of fine sandy loam below a depth of 60 inches.

Tabor Series

The Tabor series consists of deep, gently sloping, moderately well drained soils on uplands (fig. 29). These soils are very slowly permeable. They formed in acid to alkaline interbedded clayey and loamy material. Slope ranges from 1 to 5 percent. The soils of the Tabor series are fine, montmorillonitic, thermic Udertic Paleustalfs.

Typical pedon of Tabor fine sandy loam, 1 to 5 percent slopes; from U.S. Highway 79 in Marquez, 1.25 miles east on Texas Highway 7, and 1,000 feet south, in pasture.

A—0 to 8 inches; brown (10YR 5/3) fine sandy loam; weak fine granular structure; hard, very friable; many fine roots; medium acid; clear smooth boundary.

E—8 to 16 inches; light yellowish brown (10YR 6/4) fine sandy loam; weak fine granular structure; hard, very friable; few fine pores; common fine roots; slightly acid; abrupt wavy boundary.

Bt1—16 to 37 inches; yellowish brown (10YR 5/6) clay; many medium prominent dark red (2.5YR 3/6) mottles and few fine distinct light brownish gray (10YR 6/2) mottles; strong medium blocky structure; extremely hard, very firm; few fine roots; few fine pores; continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt2—37 to 52 inches; coarsely and distinctly mottled light brownish gray (10YR 6/2), brownish yellow (10YR 6/6), and dark red (2.5YR 3/6) clay; strong medium blocky structure; extremely hard, very firm; few fine roots; few fine pores; continuous clay films on faces of peds; strongly acid; gradual wavy boundary.

BC—52 to 63 inches; coarsely and distinctly mottled gray (10YR 6/1) and dark red (2.5YR 3/6) clay; moderate medium blocky structure; extremely hard, very firm; thin patchy clay films on faces of peds; strongly acid; gradual wavy boundary.

C—63 to 80 inches; white (10YR 8/2), dark red (2.5YR 3/6), brown (10YR 5/3), and brownish yellow (10YR 6/6) stratified clay, shale, and weakly cemented sandstone; massive; extremely hard, very firm; pressure faces on some cleavage planes in upper part; strongly acid.

The solum ranges from 40 to 70 inches in thickness. Base saturation is above 75 percent in some part of the Bt horizon.

The A horizon is dark grayish brown, dark brown, or brown. The E horizon is brown, pale brown, or light yellowish brown. Some pedons contain rounded siliceous pebbles and gravel in the A and E horizons. Reaction is medium acid or slightly acid in both horizons. The A and E horizons have combined thickness of more than 10 inches in more than half of the pedon.

The upper part of the Bt horizon is light yellowish brown, brownish yellow, or yellowish brown. It has many mottles in shades of red, yellow, brown, and gray. The lower part of the Bt horizon is coarsely mottled brown, yellow, and gray. The Bt horizon is 40 to 55 percent clay. The reaction is very strongly acid or strongly acid.

The BC and C horizons are strongly acid to mildly alkaline. Some pedons contain gypsum crystals and calcium carbonate concretions. The texture of the C horizon is clay, clay loam, or sandy clay. In some pedons, this horizon contains thin strata of shale and weakly cemented sandstone.

Tenaha Series

The Tenaha series consists of deep, strongly sloping to moderately steep, well drained soils on uplands. These soils are moderately permeable. They formed in sandy and clayey sediments. Slope ranges from 8 to 20 percent. The soils of the Tenaha series are loamy, siliceous, thermic Arenic Hapludults.

Typical pedon of Tenaha loamy fine sand, in an area of Tenaha-Cuthbert complex, 8 to 20 percent slopes, from Farm Road 831 in Flo, 1.4 miles northwest on a county road, and 50 feet northeast, in forest.

A—0 to 5 inches; dark brown (10YR 3/3) loamy fine sand; weak fine granular structure; soft, loose; many fine roots; medium acid; clear smooth boundary.

E—5 to 36 inches; brown (7.5YR 5/4) loamy fine sand; single grained; soft, loose; few fine roots; few ironstone pebbles; medium acid; clear smooth boundary.

Bt1—36 to 48 inches; yellowish red (5YR 5/8) sandy clay loam; moderate medium subangular blocky structure; very hard, firm; continuous clay films on faces of peds; few fine roots; strongly acid; gradual wavy boundary.

Bt2—48 to 57 inches; strong brown (7.5YR 5/8) sandy clay loam; common medium distinct red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very hard, firm; patchy clay films on faces of peds; few fine roots; strongly acid; gradual wavy boundary.

C—57 to 72 inches; reddish yellow (7.5YR 6/8) soft weathered sandstone that is sandy loam; massive; very hard, friable; common discontinuous strata of ironstone fragments up to 2.5 centimeters thick; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Ironstone pebbles range from none to 15 percent, by volume.

The A horizon is very dark grayish brown, dark brown, brown, and dark yellowish brown. It is 2 to 6 inches thick. The E horizon is brown, pale brown, yellowish brown, and light brown. It is 20 to 38 inches thick. Reaction of the A and E horizons is strongly acid or medium acid. Combined thickness of these horizons is 20 to 40 inches.

The Bt horizon is yellowish red, strong brown, and yellowish brown. Some pedons are mottled in shades of red and yellow. Clay content of the upper 20 inches of this horizon is 22 to 35 percent. Pockets or fragments of gray weathered shale and mica flakes are in some pedons. Reaction of the Bt horizon is very strongly acid or strongly acid.

The C horizon is soft sandstone that has layers of gray shale in some pedons. Some pedons have numerous mica flakes. The C horizon is in hue of red, yellow, or brown, and the shale layers are gray and red. Reaction is very strongly acid or strongly acid.

Tonkawa Series

The Tonkawa series consists of deep, gently sloping to strongly sloping, excessively drained soils on uplands. These soils are rapidly permeable. They formed in deep beds of sand. Slope ranges from 1 to 8 percent. The soils of the Tonkawa soils are thermic, coated Typic Quartzipsamments.

Typical pedon of Tonkawa fine sand, 1 to 8 percent slopes; 6 miles east of Centerville on Texas Highway 7, 2.6 miles southeast on Farm Road 811, 2.3 miles northeast and east on a private road (state property), and 400 feet south, in a clearing.

A—0 to 18 inches; dark brown (10YR 4/3) fine sand; weak fine granular structure; soft, loose; slightly acid; gradual smooth boundary.

C1—18 to 36 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; slightly acid; gradual smooth boundary.

C2—36 to 58 inches; yellowish brown (10YR 5/6) fine sand; single grained; loose; slightly acid; gradual smooth boundary.

C3—58 to 84 inches; white (10YR 8/2) fine sand; single grained; loose; slightly acid.

The sandy material is more than 80 inches thick. The soil is very strongly acid to slightly acid. Silt plus clay is 5 to 10 percent.

The A horizon is dark grayish brown, dark brown, brown, or yellowish brown.

The C horizon is yellowish brown, very pale brown, light gray, or white. The texture is fine sand or sand. In some pedons, lamellae that are not thick enough to be an argillic horizon are below a depth of 70 inches.

Trawick Series

The Trawick series consists of deep, gently sloping to moderately steep, well drained soils on uplands. These soils are moderately slowly permeable. They formed in thick marine sediment rich in glauconite. Slope ranges from 1 to 20 percent. The soils of the Trawick series are fine, kaolinitic, thermic Mollic Hapludalfs.

Typical pedon of Trawick fine sandy loam, 1 to 5 percent slopes; 18 miles east of Centerville on Texas Highway 7, 3.9 miles northwest on Farm Road 542, and 275 feet northeast, in pasture.

Ap—0 to 6 inches; dark red (2.5YR 3/6) fine sandy loam; weak medium granular structure; slightly hard, friable; common fine and medium roots; 2 to 3 percent, by volume, medium ironstone gravel; slightly acid; clear smooth boundary.

Bt—6 to 35 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; very hard, firm; few medium roots; continuous clay films on surfaces of peds; medium acid; gradual wavy boundary.

BC—35 to 43 inches; dark red (2.5YR 3/6) clay; common medium prominent olive yellow (2.5Y 6/8) masses of weathered glauconitic material and dark olive gray (5Y 3/2) masses of glauconitic greensand; weak medium subangular blocky structure; very hard, firm; medium acid; gradual wavy boundary.

Cr—43 to 60 inches; olive yellow (2.5Y 6/8) weathered glauconitic material or glauconitic greensand; platy to massive; hard; strongly acid.

The solum ranges from 40 to 60 inches in thickness.

The A horizon is dark red, dark reddish brown, or dusky red. The texture is fine sandy loam or clay loam. Reaction is medium acid to neutral. This horizon contains up to 5 percent ironstone pebbles. It is 4 to 10 inches thick.

The Bt horizon is dark red or red. The texture is clay or clay loam. Clay content is 35 to 50 percent. Reaction is very strongly acid to medium acid.

The BC horizon is dark red or red. The texture is clay or clay loam with interbedded yellowish weathered glauconitic material. Reaction is very strongly acid to medium acid.

The Cr horizon is brown, yellowish brown, and olive yellow. It is weathered glauconitic material or glauconitic greensand interbedded with layers of ironstone.

Wilson Series

The Wilson series consists of deep, nearly level, somewhat poorly drained soils on ancient terraces or uplands. These soils are very slowly permeable. They formed in alkaline clayey sediment. Slope is 0 to 1 percent. The soils of the Wilson series are fine, montmorillonitic, thermic Vertic Ochraqualfs.

Typical pedon of Wilson clay loam, 0 to 1 percent slopes; from U.S. Highway 79 in Jewett, 1.7 miles northwest on Farm Road 39, and 1,500 feet west, in pasture.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam; weak fine subangular blocky structure, massive when dry; very hard, firm; common fine roots; few ironstone pebbles; medium acid; abrupt smooth boundary.

Btg1—7 to 26 inches; very dark gray (10YR 3/1) clay; few fine faint yellowish brown mottles; strong medium blocky structure; extremely hard, very firm; few fine roots; few fine pores; common clay films on faces of peds; few ironstone pebbles, medium acid; gradual wavy boundary.

Btg2—26 to 41 inches; dark gray (N 4/0) clay; few fine faint light olive brown mottles; strong medium blocky structure; extremely hard, very firm; few fine roots; few fine pores; thin continuous clay films on faces of peds; fine medium pressure faces; medium acid; gradual wavy boundary.

BCg1—41 to 56 inches; dark gray (10YR 4/1) clay; weak coarse blocky structure; extremely hard, very firm; few fine pores; patchy clay films on faces of peds; common fine crystals of gypsum; moderately alkaline; gradual wavy boundary.

BCg2—56 to 80 inches; light brownish gray (2.5YR 6/2) clay; many coarse distinct light gray (10YR 6/1) mottles and few fine distinct brownish yellow (10YR 6/6) mottles; massive to weak coarse blocky structure; extremely hard, very firm; many fine, medium, and coarse crystals of gypsum; moderately alkaline.

The solum ranges from 60 to more than 80 inches in thickness. Cracks about 0.5 inch wide form to a depth of 24 inches or more during dry periods.

The A horizon is black, very dark gray, very dark grayish brown, or dark gray. The texture is loam or clay loam. Reaction is medium acid to neutral. The A horizon is massive and hard to very hard when dry but is weak granular when moist. It is 3 to 10 inches thick.

Some pedons have a light gray E horizon less than 1 inch thick.

The Btg1 horizon is very dark gray, black, or dark gray. Some pedons have a few brownish and yellowish mottles. The texture is clay or clay loam with clay content of 35 to 60 percent. Reaction ranges from medium acid to moderately alkaline.

The Btg2 and BCg1 horizons are dark gray, light brownish gray, olive brown, or gray. Some pedons have olive, brown, and yellow mottles. The texture is clay or clay loam. Pressure faces are common. Gypsum crystals and calcium carbonate concretions are common in most pedons. Reaction is neutral to moderately alkaline.

The BCg2 horizon is gray, light brownish gray, brownish yellow, and grayish brown. It has few to many mottles in shades of yellow, red, brown, olive, and gray. Gypsum crystals and calcium carbonate concretions are common in most pedons. Reaction is neutral to moderately alkaline.

Wolfpen Series

The Wolfpen series consists of deep, gently sloping to strongly sloping, well drained soils on uplands. These soils are moderately permeable. They formed in loamy sediment. Slope ranges from 1 to 8 percent. The soils of the Wolfpen series are loamy, siliceous, thermic Arenic Paleudalfs.

Typical pedon of Wolfpen loamy fine sand, 1 to 8 percent slopes; about 6 miles east of Centerville on Texas Highway 7, 1.6 miles north on the county road leading to the Pleasant Springs Community, 1.1 miles east to the intersection of two private roads (X-shaped), 2,000 feet southeast on a private road, and 1,000 feet east, in forest.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loamy fine sand; single grained; loose; many fine roots; slightly acid; clear smooth boundary.

E1—3 to 25 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose; common fine roots; medium acid; clear smooth boundary.

E2—25 to 30 inches; very pale brown (10YR 7/4) loamy fine sand; single grained; loose; medium acid; clear smooth boundary.

Bt1—30 to 45 inches; mottled light brownish gray (10YR 6/2), red (2.5YR 4/8), and strong brown (7.5YR 5/8) sandy clay loam; weak moderate subangular blocky structure; slightly hard, friable; patchy clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—45 to 55 inches; light gray (10YR 7/2) sandy clay loam; common medium prominent red (2.5YR 4/8) mottles and common medium distinct strong brown (7.5YR 5/8) mottles; weak moderate subangular blocky structure; slightly hard, friable; patchy clay films of faces of peds; very strongly acid; clear smooth boundary.

BC—55 to 80 inches; pale brown (10YR 6/3) sandy clay loam; few fine prominent dark red (10YR 3/6) mottles and few medium distinct strong brown
(7.5YR 5/8) mottles; weak medium su
blocky structure; very hard, very firm,
acid.

The solum ranges from 80 to more thar
in thickness. Clay content of the upper 20
Bt horizon is 20 to 30 percent.

The A horizon is dark grayish brown, da
brown, or dark yellowish brown. Reaction
acid or slightly acid. The A horizon is 3 to
thick.

The E horizon is pale brown, light yellov
very pale brown. Reaction is medium acid
acid. It is 17 to 28 inches thick.

The Bt1 horizon is yellowish brown or b
yellow, or it is mottled in these colors and
reddish brown, yellowish red, strong browr
brownish gray. The Bt2 horizon has the sa
colors as the Bt1 horizon and includes ligh
texture of the Bt horizon is sandy clay loan
loam. Reaction is very strongly acid to mec
Pockets and streaks of uncoated sand are
part of the Bt horizon of many pedons.

The BC horizon is yellowish brown or gr
mottled in these colors and in red. The tex
clay loam. Reaction is very strongly acid to

Some pedons have a C horizon that is p
brownish yellow, or light gray. It has few to
mottles in shades of red, gray, and yellow.
is sandy clay loam or clay loam. Reaction i
strongly acid.

Woodtell Series

The Woodtell series consists of deep, ge
to strongly sloping, moderately well drained
uplands. These soils are very slowly perme
formed in unconsolidated loamy and clayey
Slope is 1 to 12 percent. The soils of the W
series are fine, montmorillonitic, thermic Ve
Hapludalfs.

Typical pedon of Woodtell fine sandy loa
percent slopes; 9.7 miles southeast of Cent
Farm Road 1119, 3 miles east and north on
811, and 0.75 mile southeast on a private fa
pasture.

A—0 to 5 inches; grayish brown (10YR 5/2)
loam; weak fine granular structure; hard,
common fine roots; medium acid; clear s
boundary.

E—5 to 8 inches; very pale brown (10YR 7/4 sandy loam; weak fine granular structure; hard, friable; common fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 19 inches; red (2.5YR 4/6) clay; moderate medium subangular blocky structure; very hard, very firm; common fine roots; continuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—19 to 37 inches; red (2.5YR 4/6) clay; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; very hard, very firm; continuous clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt3—37 to 48 inches; light brownish gray (10YR 6/2) clay; common fine prominent red (2.5YR 4/6) mottles and few fine distinct reddish yellow (7.5YR 6/8) mottles; weak moderate subangular blocky structure; very hard, very firm; very strongly acid; gradual wavy boundary.

C—48 to 60 inches; light brownish gray (10YR 6/2) stratified platy clayey shale and reddish yellow (7.5YR 6/8) sandstone; hard, firm, few fine calcium sulfate crystals; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Clay content of the upper 20 inches of the Bt horizon is 40 to 60 percent.

The A horizon is very dark grayish brown, dark grayish brown, dark brown, grayish brown, or light yellowish brown. Reaction is strongly acid or medium acid. The A horizon is 4 to 9 inches thick.

The E horizon is pale brown, light yellowish brown, pink, or very pale brown. Reaction is very strongly acid to slightly acid. The E horizon is less than 4 inches thick. Some pedons do not have an E horizon.

The Bt1 horizon is reddish brown or red. Mottles that have chroma of 2 or less range from none to common. Reaction is very strongly acid to medium acid.

The Bt2 and Bt3 horizons are mottled in shades of red, yellow, brown, and gray. The amount of gray increases with depth. The mottles are in various sizes. The texture is clay, sandy clay, or clay loam. Reaction is very strongly acid to slightly acid.

Some pedons have a BC horizon that is mottled in shades of red, yellow, and gray, or it is dominantly gray. The mottles are in various amounts and sizes. The texture is sandy clay or sandy clay loam. Reaction is strongly acid to slightly acid.

The C horizon is gray, light gray, light brownish gray, or olive gray. Mottles range from few to common in shades of yellow, brown, and red. The C horizon is stratified clayey shale, sandy clay loam or clay loam, and sandstone. Reaction is very strongly acid to neutral.

Formation of the Soils

This section describes the factors of soil formation and relates them to the formation of the soils in Leon County. It also describes the surface geology of the survey area.

Factors of Soil Formation

Soil is formed by the action of soil-forming processes on material deposited or accumulated by geological forces. The characteristics of a soil at any given point depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and has existed since accumulation, the plant and animal life on and in the soil, the relief or lay of the land, and the length of time the forces of soil development have acted on the soil material.

All five of these factors are important in the genesis of each soil; some have had more influence than others on a given soil.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineral composition of the soil. In Leon County, the parent material consists of unconsolidated, sandy, loamy, and clayey sediment deposited by water of the upper Cretaceous, Paleocene, Eocene, Pleistocene, and Holocene Epochs.

Deposits of the upper Cretaceous and Paleocene Epochs are sediments of the Wilcox, Midway, Navarro, and Taylor groups. These sediments are exposed at the surface because of the uplift of a subsurface salt core. Soils on uplands have formed from these sediments. Deposits of the Eocene Epoch are the Calvert Bluff, Carrizo Sand, Reklaw, Queen City Sand, Weches, Sparta Sand, Stone City, Cook Mountain, and Yegua Formations. Soils on the uplands have also formed from these formations. The Pleistocene Epoch deposits are those sediments on the different fluviatile terrace levels of the Trinity and Navasota Rivers. The Holocene Epoch includes the recent alluvial deposits of bottom lands along the Trinity and Navasota Rivers and the many smaller streams in the county.

The Marquez, Hearne, Gasil, Axtell, Lufkin, Rader, and Ferris soils formed from the Wilcox, Midway, Navarro, and Taylor groups. These soils are loamy and clayey.

The Arenosa, Padina, Silstid, Tonkawa, Pickton, Wolfpen, Marquez, Hearne, Cuthbert, Kirvin, Robco, and Lummus soils formed from the Carrizo Sand, Reklaw, Queen City Sand, and Sparta Sand Formations. These soils have a sandy and loamy surface layer and a sandy, loamy, and clayey subsoil.

The Margie, Flynn, Jedd, Trawick, Elrose, Bub, Lexton, Hearne, Marquez, and Cuthbert soils formed from the Weches and Stone City Formations. These soils are red and have a clayey and loamy subsoil. Steep slopes and ironstone and gravel ridges are commonly associated with areas of these soils at a higher elevation.

The Crockett, Wilson, Dimebox, Benchley, Rader, Oakwood, and Lummus soils formed from the Cook Mountain and Yegua Formations. These soils have a loamy and clayey surface layer and a clayey subsoil.

Fluviatile terraces are along the large rivers and streams. Rader, Derly, Bienville, Ashford, Attoyac, Silawa, Gasil, Burleson, Eufaula, and Chazos soils are in these areas. These soils formed in old alluvium that has been modified by wind. They vary greatly and have a loamy, sandy, and clayey surface layer and subsoil.

The soils in the alluvial areas, or bottom lands that flood, have little horizon development. The Gladewater, Kaufman, Nahatche, and Hatliff soils are in these areas. These soils are clayey and loamy.

Climate

The climate of Leon County is warm and humid. Rainfall, evaporation, and temperature are the main climatic influences. Because of the rainfall and evaporation factors, the county is divided into two soil groups. This transition of soils occurs approximately midway through the county in a zigzag north-south direction. Soils in the western part of the county are of the drier or subhumid group, and soils in the eastern part are of the moist or humid group. This unique feature results in soils that are similar in physical features and chemical properties, but because of climatic changes, the natural vegetation changes gradually from east to west throughout the county. In addition, the effects of rainfall are modified locally by runoff caused by steepness of slope.

Plant and Animal Life

Plants, insects, earthworms, animals, micro-organisms, and other living organisms, including man, have contributed to the development of the soils. Gains in organic matter and nitrogen content of the soil, gains and losses in plant nutrients, and changes in structure and porosity are caused by plants, animals, and man. In the northwest part of the county, the changes in structure, porosity, and fertility are caused not only by the cultivation of the soil but also by the massive restructuring of the soil and landscape by surface lignite mining. Large acreages will need reclamation and revegetation work. Careful selection of plant species and nutrient requirements will be needed to produce vegetative cover that can exist in a conglomerate of mine spoil and remnants of soil.

Pine and hardwood trees, grasses, and shrubs have played a major role in soil development. The roots of these plants have decayed and left pores and holes that serve as passageways for water and air. These decayed parts are helped by the fungi and bacteria to produce organic matter and improve fertility.

Relief

Relief, or topography, influences soil development through its effect on drainage, runoff, and depth of penetration by soil moisture.

The relief of the survey area is nearly level to steep. The nearly level areas consist of bottom lands throughout the county and terraces in the eastern and western parts of the county. The more sloping areas are mostly higher on the landscape, and the steep areas are in the highest positions.

If other factors are equal, the degree of soil profile development depends on the amount of and depth of penetration by soil moisture. The more often a soil passes through a wetting and drying cycle, the greater and the more distinct is the soil development.

Soils on a nearly level landscape tend to have marked differences in soil development. Nearly level areas that are poorly drained and that remain saturated much of the time generally do not have pronounced soil horizonation. For example, the Ashford and Derly soils are nearly level to ponded and are gray throughout the subsoil. These soils are degraded and generally are not well developed below a depth of 60 inches. Nearly level soils that are well drained generally are distinctly developed to a depth of more than 80 inches.

Most of the gently sloping and sloping soils are developed to a depth of more than 60 inches. As the slope increases above 8 percent, the depth of water penetration generally decreases. Since much of the water is removed by runoff, the soils in the more sloping areas tend to be shallower. For example, the Trawick-Bub complex is mostly strongly sloping to moderately steep and is deep to shallow over marine sediment. Most of the other soils in the survey area are deep and moderately deep.

Time

A great length of time is required for the formation of soils with distinct horizons. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of soil horizons. Young soils have very little horizon development, and old soils have well expressed horizons.

Nahatche and Hatliff soils are young soils. They are on bottom lands that are flooded, and sediment is continuously added. These soils have little soil horizon development.

The Attoyac soils are of intermediate age. Because they are on fluviatile terraces that have not been deposited as long as most landforms of the area, they have not undergone maximum development. These soils have not been leached of their bases as have many of the older soils on the uplands.

Advanced stages of development are evident in the Kirvin soils. These soils have distinct horizonation, having been leached of most bases.

Surface Geology

Homer H. Logan, geologist, Soil Conservation Service, helped prepare this section.

Leon County is in the Coastal Plain physiographic region of Texas. All of the formations in the county are sedimentary. They dip toward the Gulf of Mexico at low angles, which average less than 1 degree or 75 feet per mile *(11)*, and crop out as northeast-southwest striking bands across the county *(18, 19, 20)*. The formations are progressively younger to the southeast, towards the Gulf of Mexico.

The survey area is irregularly shaped and lies between the Navasota River on the west and the Trinity River on the east. Most of the drainage in the area is to the Trinity River. The divide between the drainage areas of the Trinity River and the Navasota River nearly follows Farm Road 39 in the western part of the county. The eastern and western borders of the survey area are Holocene alluvial deposits on the bottom lands. These areas are represented as the Gladewater-Kaufman general soil map unit. Holocene alluvial deposits along the larger streams extend into the interior of the survey area. These deposits are in the Hatliff-Nahatche map unit on the general soil map. They are in the many long, narrow areas that extend northwest from the Trinity River and to the northeast from the Navasota River.

An east-west trending cuesta occupied by the Margie-Jedd-Lexton and Trawick-Bub-Cuthbert general soil map units is called the Nacogdoches Escarpment *(1)*. This cuesta is the outcrop of the Weches Formation and forms a prominent ridge across the county.

The normal sequence of formations, from the north to the south, are the Wilcox group, which includes the Calvert Bluff Formation, and the Claiborne group, which includes the Carrizo Sand, Reklaw, Queen City Sand, Weches, Sparta Sand, Stone City, Cook Mountain, and Yegua Formations *(10)*. These are Eocene age deposits. Besides this normal sequence there are several groups of older formations exposed in the small area of the Marquez salt dome northwest of Marquez. These older formations were brought to their present surface exposure by the rising of the subsurface salt core. The Wilcox, Midway, Navarro, and Taylor groups are in this area. The Navarro and Taylor groups are Upper Cretaceous age deposits, and the Midway group is Paleocene age deposits. Pleistocene age deposits form several terrace levels on the major river and stream systems, and Holocene age deposits form the stream and river bottom lands.

The Calvert Bluff Formation, which is exposed in the extreme northwestern part of Leon County, is made up mostly of mudstone with various amounts of sandstone, lignite, and ironstone concretions. Soils that have formed in these sediments are common to the Axtell-Rader general soil map unit.

The Carrizo Sand Formation forms a broad belt across the northwestern part of the county and is dominated by sandy soils. The formation is made up mostly of fine grained sand with partings of silty clay and carbonaceous clay. Soils that have formed in these sediments are mostly of the Padina-Silstid-Hearne and Padina-Arenosa general soil map units. This formation produces good quality ground water *(9)*.

The Reklaw Formation forms a narrow prairie and low rolling hills from southwest of Marquez to northeast of Jewett. The Reklaw Formation has two members, the Marquez shale and the Newby glauconitic sand *(11)*. The Marquez member is made up of clay and silt, is carbonaceous, and has lentils of glauconitic clay and ironstone. The Newby member is made up of sand and clay that has layers of glauconitic sandstone. The author of this section believes that this formation is overlain by a terrace veneer that has been partly reworked by wind. Soils that have formed in these sediments are mostly of the Axtell-Rader general soil map unit.

The Queen City Sand Formation occupies approximately the northern half of the surface area of Leon County. This formation is made up of fine grained quartz sand that is locally carbonaceous and has thin interbeds of clay, silt, and a few lentils of glauconitic quartz greensand. Soils that have formed in these sediments are common to the Wolfpen-Pickton-Cuthbert, Padina-Silstid-Hearne, Padina-Arenosa, and Pickton-Tonkawa general soil map units. This formation also produces good quality ground water *(9)*.

The Weches Formation is a relatively thin band that crosses the county from west to east. This formation forms a prominent cuesta and is known as the "redlands." It is made up of greensand, sand, and clay. The greensand is mostly glauconitic but is partly marl. It locally forms layers of limonitic iron ore and clay ironstone concretions. Soils that have formed in these sediments are of the Margie-Jedd-Lexton and Trawick-Bub-Cuthbert general soil map units.

The Sparta Sand Formation forms a broad belt across the county from near the Hilltop Lakes area to east of Centerville along Texas Highway 7. This formation is similar to the Carrizo Sand Formation in that it forms dominantly sandy soils. The Sparta Sand Formation is made up mostly of fine grained quartz sand that has silty clay partings that are laminated. It is locally carbonaceous. Soils that have formed in these sediments are the same as those that have formed in the Queen City Sand sediments. This formation also produces good quality ground water *(9)*.

The Stone City Formation forms a belt across the county from north of Normangee to east of Centerview in eastern Leon County. This formation is made up mostly of clays, silts, and sands and is interbedded with glauconitic sands. The tops of many small knolls and hills are covered with small ironstone gravel and are mined for roadbed material. Soils that have formed in these sediments are mostly of the Padina-Silstid-Hearne and Wolfpen-Pickton-Hearne general soil map units.

The Cook Mountain Formation forms a belt along the southern boundary of Leon County from southwest of Normangee to near Guys Store in the southeastern part of the county. This formation makes up the prairie region in the southern part of the county. This formation has four members, the Wheelock, Landrum, Spiller, and Mount Tabor *(11)*. The Wheelock and Landrum members, which are exposed on the northern part of this formation, are made up mostly of marly clays, glauconitic calcareous ironstone, and limestones that have bentonitic lentils and contain abundant marine mega fossils. The Spiller member is made up mostly of sands. The southern most member, the Mount Tabor, is made up mostly of clay and marly sands. Soils that have formed in this formation are mostly of the Crockett-Benchley-Wilson general soil map unit.

Pliocene age deposits of unconsolidated, pebble-size siliceous gravels occur on higher ridges and divides throughout the county. These Pliocene deposits are of minor extent and are a thin veneer or gravel lag on the surface of some soils. A few areas as large as 5 acres and 1 or 2 feet thick have been mined for road material.

Pleistocene age deposits form several fluviatile terrace levels on the major river and stream systems. These terraces are best defined along the Trinity River and Navasota River. The Geologic Atlas of Texas, Palestine Sheet *(18)*, defines these as Qt1, which is 15 to 20 feet above the present flood plain; Qt2, which is 30 to 40 feet; and Qt3, which is 50 to 75 feet. These deposits are made up of sands, silts, and clays. The soils that have formed in these sediments are mostly of the Rader-Attoyac-Derly, Bienville, and Burleson-Garner general soil map units.

The youngest geologic unit in the county is the Holocene alluvium on the flood plains of the major rivers and streams and the intermittent tributary streams and creeks. The major river flood plain deposits are represented by the Gladewater-Kaufman general soil map unit. The minor intermittent streams and larger stream deposits are represented by the Hatliff-Nahatche general soil map unit.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well-aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels, i.e., clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). The volume of soft soil decreases excessively under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping sequence. Rotating high residue crops with low residue crops to provide organic material for maintaining soil tilth.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour farming. A practice in which the soil is worked following the contour. Farming on the contour helps to control water erosion and allows more water to enter the soil. It is beneficial on most soils that have slopes of more than 1 percent.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic).—Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated).—Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, such as fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay are in the soil. The soil is not a source of gravel or sand for construction purposes.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grains are grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The movement of water into the soil is rapid.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant that is not a grass or a sedge.

Fragile (in tables). The soil is easily damaged by use or disturbance.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of Vertisols—clayey soils having a high coefficient of expansion and contraction with changes in moisture content.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green-manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is, in part, a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as accumulation of clay, sesquioxides, humus, or a combination of these; prismatic or blocky structure; redder or browner colors than those in the A horizon; or a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock (unweathered bedrock) beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the plants that are the less palatable to livestock.

Infiltration. The downward entry of water into the immediate surface of soil or other material. This contrasts with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Large stones (in tables). Rock fragments that are 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move through the profile. Permeability is measured as the number of inches per hour that water moves through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Subsurface tunnels or pipelike cavities are formed by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plinthite. The sesquioxide-rich, humus-poor, highly weathered mixture of clay with quartz and other diluents. It commonly appears as red mottles, usually in platy, polygonal, or reticulate patterns. Plinthite changes irreversibly to an ironstone hardpan or to irregular aggregates on repeated wetting and drying, especially if it is exposed also to heat from the sun. In a moist soil, plinthite can be cut with a spade. It is a form of laterite.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). In these areas, surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential climax vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of the acidity or alkalinity of a soil expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH value are—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Rippable bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). There is a shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). The soil mass is susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in organic matter content than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed on the contour or at a slight angle to the contour across sloping soils. The terrace intercepts surface runoff, so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). An otherwise suitable soil material that is too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). An excessive amount of toxic substances in the soil, such as sodium or sulfur, severely hinders the establishment of vegetation or severely restricts plant growth.

Trace elements. Chemical elements, such as zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). There is a risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited in stream valleys by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced by atmospheric agents in rocks or other deposits at or near the earth's surface. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. This contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-81 at Centerville, Texas]

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January--------	57.6	34.8	46.2	80	12	102	2.86	1.20	4.27	6	.3
February-------	61.9	38.2	50.1	83	17	119	3.18	1.51	4.62	6	.3
March----------	70.1	45.7	57.9	87	23	276	2.79	1.13	4.18	5	.0
April----------	78.0	55.2	66.6	90	33	498	4.62	2.50	6.47	6	.0
May------------	84.2	61.9	73.1	94	43	716	4.02	1.82	5.91	5	.0
June-----------	91.2	68.7	80.0	100	55	900	3.36	1.24	5.12	5	.0
July-----------	95.6	71.5	83.6	105	63	1,042	2.15	.51	3.44	4	.0
August---------	95.9	70.5	83.2	105	60	1,029	2.62	.67	4.16	4	.0
September------	89.6	65.1	77.4	101	48	822	3.88	1.66	5.75	5	.0
October--------	81.0	53.4	67.2	95	33	533	3.91	1.12	6.17	4	.0
November-------	69.3	43.9	56.6	87	23	331	3.12	1.44	4.55	5	.0
December-------	61.9	38.0	50.0	81	16	107	2.93	1.46	4.19	5	.0
Yearly:											
Average---	78.0	53.9	66.0	---	---	---	---	---	---	---	---
Extreme---	---	---	---	105	12	---	---	---	---	---	---
Total-----	---	---	---	---	---	6,375	39.44	30.41	47.93	60	.6

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-81 at Centerville, Texas]

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	March 15	April 2	April 8
2 years in 10 later than--	March 5	March 24	April 2
5 years in 10 later than--	February 14	March 5	March 21
First freezing temperature in fall:			
1 year in 10 earlier than--	November 15	November 1	October 23
2 years in 10 earlier than--	November 23	November 9	October 29
5 years in 10 earlier than--	December 10	November 23	November 8

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-81 at Centerville, Texas]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	268	224	207
8 years in 10	278	237	215
5 years in 10	296	263	231
2 years in 10	316	289	247
1 year in 10	328	302	256

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
ArC	Arenosa fine sand, 1 to 8 percent slopes	17,560	2.5
As	Ashford clay loam, 0 to 1 percent slopes	3,020	0.4
AtB	Attoyac fine sandy loam, 0 to 3 percent slopes	2,070	0.3
AtD	Attoyac fine sandy loam, 3 to 12 percent slopes	7,980	1.2
AxA	Axtell fine sandy loam, 0 to 1 percent slopes	2,150	0.3
AxB	Axtell fine sandy loam, 1 to 5 percent slopes	9,480	1.4
AxD	Axtell fine sandy loam, 5 to 12 percent slopes	4,470	0.6
BeB	Benchley clay loam, 1 to 5 percent slopes	3,490	0.5
BeD	Benchley clay loam, 5 to 8 percent slopes	620	0.1
BnB	Bienville loamy fine sand, 0 to 3 percent slopes	10,350	1.5
BuA	Burleson clay, 0 to 1 percent slopes	1,820	0.3
BuB	Burleson clay, 1 to 3 percent slopes	1,210	0.2
ChB	Chazos loamy fine sand, 1 to 5 percent slopes	1,020	0.1
CrB	Crockett fine sandy loam, 1 to 5 percent slopes	7,780	1.1
CrD	Crockett fine sandy loam, 5 to 10 percent slopes	2,520	0.4
CsB	Crockett-Wilson complex, 1 to 3 percent slopes	8,610	1.2
CuE	Cuthbert fine sandy loam, 5 to 20 percent slopes	34,650	5.0
CxE	Cuthbert fine sandy loam, 5 to 20 percent slopes, stony	860	0.1
De	Derly silt loam, 0 to 1 percent slopes	3,340	0.5
Df	Derly-Rader complex, gently undulating	6,890	1.0
DmA	Dimebox silty clay, 0 to 1 percent slopes	1,740	0.3
DuC	Dutek loamy fine sand, 1 to 8 percent slopes	2,030	0.3
ErC	Elrose fine sandy loam, 3 to 8 percent slopes	1,270	0.2
EuB	Eufaula loamy fine sand, 1 to 5 percent slopes	370	0.1
FeB	Ferris clay, 1 to 5 percent slopes	270	*
FeD	Ferris clay, 5 to 15 percent slopes	210	*
FoC	Flo loamy fine sand, 1 to 8 percent slopes	4,630	0.7
FyC	Flynn fine sandy loam, 3 to 8 percent slopes	1,180	0.2
GaA	Garner clay, 0 to 1 percent slopes	2,440	0.4
GfB	Gasil fine sandy loam, 1 to 5 percent slopes	20,650	3.0
GfD	Gasil fine sandy loam, 5 to 8 percent slopes	450	0.1
Gg	Gladewater clay, occasionally flooded	3,510	0.5
Gh	Gladewater clay, frequently flooded	13,590	2.0
Gp	Gladewater clay, depressional	1,610	0.2
Gw	Gowker clay loam, frequently flooded	2,300	0.3
Ha	Hatliff fine sandy loam, frequently flooded	48,860	7.1
HeB	Hearne fine sandy loam, 1 to 5 percent slopes	2,190	0.3
HeE	Hearne fine sandy loam, 5 to 20 percent slopes	27,910	4.0
HsE	Hearne fine sandy loam, 5 to 20 percent slopes, stony	2,030	0.3
HxE	Hearne fine sandy loam, graded, 5 to 20 percent slopes	980	0.1
JmE	Jedd-Margie complex, 5 to 25 percent slopes	5,690	0.8
Ka	Kaufman clay, occasionally flooded	1,880	0.3
Kf	Kaufman clay, frequently flooded	7,860	1.1
Kg	Kaufman and Gladewater soils, frequently flooded	1,060	0.2
KrB	Kirvin fine sandy loam, 1 to 5 percent slopes	7,790	1.1
KsB	Kirvin gravelly fine sandy loam, 1 to 5 percent slopes	350	0.1
LaC	Larue loamy fine sand, 1 to 8 percent slopes	3,830	0.6
LeB	Lexton clay loam, 1 to 3 percent slopes	2,090	0.3
LfA	Lufkin fine sandy loam, 0 to 1 percent slopes	2,840	0.4
LmB	Lummus fine sandy loam, 1 to 5 percent slopes	9,340	1.4
MaA	Mabank fine sandy loam, 0 to 1 percent slopes	330	*
MgB	Margie fine sandy loam, 1 to 5 percent slopes	7,550	1.1
MgD	Margie fine sandy loam, 5 to 8 percent slopes	4,240	0.6
MhC	Margie-Gullied land complex, 1 to 8 percent slopes	300	*
MkB	Marquez very fine sandy loam, 1 to 5 percent slopes	6,670	1.0
MrB	Marquez gravelly fine sandy loam, 1 to 5 percent slopes	3,070	0.4
Ms	Melhomes loamy fine sand, 0 to 1 percent slopes	4,700	0.7
Na	Nahatche loam, frequently flooded	12,330	1.8
Nu	Nugent loamy fine sand, occasionally flooded	2,760	0.4
OkB	Oakwood fine sandy loam, 1 to 5 percent slopes	7,610	1.1
PaC	Padina loamy fine sand, 1 to 8 percent slopes	51,280	7.4
PaD	Padina loamy fine sand, 8 to 15 percent slopes	12,760	1.9
PkC	Pickton loamy fine sand, 1 to 8 percent slopes	49,280	7.1

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
PkD	Pickton loamy fine sand, 8 to 15 percent slopes	18,290	2.7
RaB	Rader fine sandy loam, 1 to 3 percent slopes	24,150	3.5
RD	Rader-Derly complex, gently undulating	5,070	0.7
RoC	Robco loamy fine sand, 1 to 8 percent slopes	6,410	0.9
RxC	Robco-Gullied land complex, 1 to 8 percent slopes	160	*
SaB	Silawa fine sandy loam, 1 to 5 percent slopes	1,660	0.2
SaD	Silawa fine sandy loam, 5 to 8 percent slopes	940	0.1
SsB	Silstid loamy fine sand, 1 to 5 percent slopes	36,070	5.2
TaB	Tabor fine sandy loam, 1 to 5 percent slopes	1,030	0.1
TcE	Tenaha-Cuthbert complex, 8 to 20 percent slopes	38,480	5.6
ToC	Tonkawa fine sand, 1 to 8 percent slopes	5,740	0.8
TrB	Trawick fine sandy loam, 1 to 5 percent slopes	3,040	0.4
TxF	Trawick-Bub complex, 8 to 20 percent slopes	8,820	1.3
WsA	Wilson clay loam, 0 to 1 percent slopes	460	0.1
WoC	Wolfpen loamy fine sand, 1 to 8 percent slopes	53,284	7.7
WtC	Woodtell fine sandy loam, 1 to 5 percent slopes	3,920	0.6
WtD	Woodtell fine sandy loam, 5 to 12 percent slopes	7,230	1.0
	Water	2,387	0.3
	Total	690,861	100.0

* Less than 0.1 percent. All these map units total 0.2 percent of the county.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Land capability	Corn	Cotton lint	Grain sorghum	Soybeans	Bahiagrass	Common bermudagrass	Improved bermudagrass
		Bu	Lbs	Bu	Bu	AUM*	AUM*	AUM*
ArC------------- Arenosa	IVs	---	---	---	---	---	---	3.5
As-------------- Ashford	IVw	---	---	---	20	7.0	---	---
AtB------------- Attoyac	IIe	65	---	---	---	---	---	9.0
AtD------------- Attoyac	IVe	55	---	---	---	---	---	8.0
AxA------------- Axtell	IIIs	35	250	45	---	---	---	7.0
AxB------------- Axtell	IVe	25	200	35	---	---	---	6.0
AxD------------- Axtell	VIe	---	---	---	---	---	---	5.0
BeB------------- Benchley	IIIe	75	250	65	---	---	---	6.0
BeD------------- Benchley	IVe	---	---	---	---	---	---	5.0
BnB------------- Bienville	IIs	65	---	---	27	6.5	5.5	8.0
BuA------------- Burleson	IIw	65	450	85	---	7.0	6.5	8.0
BuB------------- Burleson	IIe	65	450	80	---	6.5	6.5	8.0
ChB------------- Chazos	IIIe	---	---	40	---	5.0	5.0	7.0
CrB------------- Crockett	IIIe	40	350	55	30	5.0	6.0	7.5
CrD------------- Crockett	VIe	---	---	---	---	---	4.0	5.0
CsB------------- Crockett-Wilson	IIIe	38	333	50	---	---	---	7.0
CuE------------- Cuthbert	VIe	---	---	---	---	3.0	3.0	4.0
CxE------------- Cuthbert	VIIs	---	---	---	---	---	---	---
De-------------- Derly	IIIw	---	260	50	25	5.0	---	6.0

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Cotton lint	Grain sorghum	Soybeans	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Lbs	Bu	Bu	AUM*	AUM*	AUM*
Df--------------- Derly-Rader	IIIw	---	---	60	---	---	---	7.0
DmA-------------- Dimebox	IIw	65	450	85	---	---	---	8.0
DuC-------------- Dutek	IIIe	---	---	30	---	---	---	5.0
ErC-------------- Elrose	IIIe	75	---	---	---	7.0	7.0	9.0
EuB-------------- Eufaula	IVs	---	---	---	---	---	---	3.0
FeB-------------- Ferris	IIIe	30	300	45	---	---	---	5.5
FeD-------------- Ferris	VIe	---	---	---	---	---	---	4.5
FoC-------------- Flo	IIIs	---	---	---	---	---	---	5.0
FyC-------------- Flynn	IVe	75	---	---	---	7.0	7.0	9.0
GaA-------------- Garner	IIIw	30	---	---	---	7.0	---	8.0
GfB-------------- Gasil	IIIe	---	250	50	---	---	---	5.5
GfD-------------- Gasil	IVe	---	150	40	---	---	---	5.0
Gg--------------- Gladewater	IVw	---	400	65	35	7.0	6.5	8.0
Gh--------------- Gladewater	Vw	---	---	---	---	7.0	6.0	7.0
Gp--------------- Gladewater	VIw	---	---	---	---	---	---	---
Gw--------------- Gowker	Vw	---	---	---	---	---	6.0	7.0
Ha--------------- Hatliff	Vw	---	---	---	---	6.0	5.5	7.0
HeB-------------- Hearne	IIIe	---	---	---	---	---	5.0	6.5
HeD-------------- Hearne	VIe	---	---	---	---	---	2.0	3.5
HeF-------------- Hearne	VIIs	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Cotton lint	Grain sorghum	Soybeans	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Lbs	Bu	Bu	AUM*	AUM*	AUM*
HxE------------- Hearne	VIe	---	---	---	---	---	3.0	4.0
JmE------------- Jedd-Margie	VIe	---	---	---	---	---	---	---
Ka-------------- Kaufman	IIw	65	500	100	35	7.0	6.0	8.5
Kf-------------- Kaufman	Vw	---	---	---	---	7.0	6.0	8.5
Kg-------------- Kaufman and Gladewater	Vw	---	---	---	---	7.0	6.0	8.0
KrB------------- Kirvin	IIIe	45	400	---	---	7.5	7.0	8.0
KsB------------- Kirvin	IVe	40	---	---	---	7.0	6.0	7.5
LaC------------- Larue	IIIe	55	---	---	---	---	---	6.0
LeB------------- Lexton	IIe	---	---	---	---	---	---	8.0
LfA------------- Lufkin	IIIw	35	200	45	---	---	4.0	5.0
LmB------------- Lummus	IIIe	---	---	---	---	7.0	---	8.0
MaA------------- Mabank	IIIw	40	330	55	---	---	---	6.0
MgB------------- Margie	IIIe	50	250	45	---	7.0	---	8.0
MgD------------- Margie	IVe	45	---	35	---	6.0	---	7.0
MhC------------- Margie-Gullied land	VIe	---	---	---	---	---	---	---
MkB, MrB-------- Marquez	IIIe	---	---	---	---	---	6.0	8.0
Ms-------------- Melhomes	VIw	---	---	---	---	4.0	3.0	---
Na-------------- Nahatche	Vw	---	---	---	---	8.0	7.0	8.0
Nu-------------- Nugent	IIIs	40	---	---	---	---	3.0	---
OkB------------- Oakwood	IIIe	55	300	50	---	---	6.0	8.0

See footnote at end of table.

TABLE 5.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Land capability	Corn	Cotton lint	Grain sorghum	Soybeans	Bahiagrass	Common bermuda-grass	Improved bermuda-grass
		Bu	Lbs	Bu	Bu	AUM*	AUM*	AUM*
PaC---------------- Padina	IIIe	---	---	---	---	---	---	5.0
PaE---------------- Padina	VIe	---	---	---	---	---	---	4.0
PkC---------------- Pickton	IIIs	60	---	---	---	---	---	6.5
PkD---------------- Pickton	IVe	45	---	---	---	---	---	6.5
RaB---------------- Rader	IIIs	55	---	70	---	---	6.5	8.0
Rd----------------- Rader-Derly	IIIs	---	---	65	---	---	---	7.5
RoC---------------- Robco	IIIe	---	---	---	---	---	---	6.0
RxC---------------- Robco-Gullied land	VIe	---	---	---	---	---	---	---
SaB---------------- Silawa	IIIe	40	300	45	---	---	---	6.0
SaC---------------- Silawa	IVe	35	---	40	---	---	---	5.5
SdB---------------- Silstid	IIIe	---	---	30	---	---	---	5.0
TaB---------------- Tabor	IVe	35	---	35	---	---	---	5.5
TcE---------------- Tenaha-Cuthbert	VIe	---	---	---	---	---	---	7.0
ToC---------------- Tonkawa	IVs	---	---	---	20	---	---	5.0
TrB---------------- Trawick	IIIe	50	350	---	---	---	---	8.0
TxE---------------- Trawick-Bub	VIe	---	---	---	---	---	---	5.0
WsA---------------- Wilson	IIIw	45	350	55	---	---	---	6.0
WoC---------------- Wolfpen	IIIs	70	---	---	---	6.0	---	7.0
WtC---------------- Woodtell	IIIe	45	250	45	20	6.5	6.5	7.5
WtE---------------- Woodtell	VIe	---	---	---	---	5.5	5.5	6.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 6.--RANGELAND PRODUCTIVITY

[Only the soils that support rangeland vegetation suitable for grazing are listed]

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable Lb/acre	Average Lb/acre	Unfavorable Lb/acre
ArC Arenosa	Very Deep Sand	3,000	2,000	1,000
AxA, AxB, AxD Axtell	Claypan Savannah	5,000	3,500	2,500
BeB, BeD Benchley	Clay Loam	6,000	5,000	3,200
BuA, BuB Burleson	Blackland	7,000	5,500	4,000
ChB Chazos	Sandy Loam	5,500	4,500	3,000
CrB, CrD Crockett	Claypan Prairie	6,000	5,000	3,000
CsB:				
Crockett	Claypan Prairie	6,000	5,000	3,000
Wilson	Claypan Prairie	6,000	4,500	3,000
De Derly	Claypan Savannah	5,000	4,000	2,500
Df:				
Derly	Claypan Savannah	5,000	4,000	2,500
Rader	Sandy Loam	6,000	4,500	3,500
DmA Dimebox	Blackland	7,000	6,000	4,500
DuC Dutek	Sandy	4,500	4,000	2,000
EuB Eufaula	Deep Sand	4,000	2,600	2,000
FeB, FeD Ferris	Eroded Blackland	7,000	5,500	4,000
FyC Flynn	Deep Redland	2,800	2,300	1,860
GfB, GfD Gasil	Sandy Loam	5,500	4,000	3,500
Gg, Gh Gladewater	Clayey Bottomland	8,000	6,000	4,000
Gp Gladewater	Clayey Bottomland	1,800	1,000	500
Gw Gowker	Loamy Bottomland	5,500	4,500	3,000

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Ha Hatliff	Loamy Bottomland	4,500	3,500	3,000
HeB, HeE Hearne	Sandy Loam	4,500	3,500	2,500
HsF Hearne	Sandstone Hills	3,800	3,200	2,000
HxE Hearne	Sandstone Hills	3,800	3,200	2,000
JmE: Jedd	Sandstone Hills	4,000	3,200	2,000
Margie	Deep Redland	3,000	2,600	2,100
Ka, Kf Kaufman	Clayey Bottomland	7,500	6,000	4,000
Kg: Kaufman	Clayey Bottomland	7,500	6,000	4,000
Gladewater	Clayey Bottomland	8,000	6,000	4,000
LeB Lexton	Deep Redland	3,000	2,200	1,700
LfA Lufkin	Claypan Savannah	5,000	4,000	2,500
MaA Mabank	Claypan Prairie	6,000	5,000	3,000
MgB, MgD Margie	Deep Redland	3,000	2,600	2,100
MhC: Margie	Deep Redland	3,000	2,600	2,100
Gullied land.				
MkB, MrB Marquez	Sandy Loam	4,500	3,500	2,500
Ms Melhomes	Flatwoods	5,000	4,000	2,500
Na Nahatche	Loamy Bottomland	5,500	4,500	3,000
Nu Nugent	Loamy Bottomland	4,000	3,400	2,800
PaC, PaD Padina	Deep Sand	4,500	3,500	2,250
RaB Rader	Sandy Loam	6,000	4,500	3,500

TABLE 6.--RANGELAND PRODUCTIVITY--Continued

Map symbol and soil name	Range site	Potential annual production for kind of growing season		
		Favorable	Average	Unfavorable
		Lb/acre	Lb/acre	Lb/acre
Rd:				
Rador	Sandy Loam	6,000	4,500	3,500
Derly	Claypan Savannah	5,000	4,000	3,000
RoC Robco	Sandy	3,600	3,000	2,600
RxC:				
Robco	Sandy	3,600	3,000	2,600
Gullied land.				
SaB, SaD Silawa	Sandy Loam	5,500	4,500	2,500
SdB Silstid	Sandy	4,500	4,000	2,000
TaB Tabor	Sandy Loam	5,000	4,000	3,500
WcA Wilson	Claypan Prairie	6,000	4,500	3,000

TABLE 7.--POTENTIAL PLANT COMMUNITY

[The numbers in the column under the range sites represent the percentage of total production of the plant species shown in the left hand column, on an air-dry basis. A dash indicates the plant does not occur in that particular range site. A letter T indicates a trace amount of production. The percentages followed by the same letter are grouped together to equal the indicated percentage. Example: In the Clayey Bottomland range site Canada wildrye, rustyseed paspalum, sedges, and Virginia wildrye each are identified with a 35a percentage; thus these four plants together equal 35 percent of the total composition of this range site]

Plant species	Range sites													
	Blackland	Clay Loam	Clayey Bottomland	Claypan Prairie	Claypan Savannah	Deep Redland	Deep Sand	Eroded Blackland	Flatwoods	Loamy Bottomland	Sandstone Hills	Sandy	Sandy Loam	Very Deep Sand
GRASSES AND GRASS-LIKES														
Blackseed needlegrass	---	---	---	---	---	---	---	---	15b	---	---	---	---	---
Bluestem, big	25a	30a	25b	15a	---	10b	---	20a	15a	35b	5b	---	10a	---
Bluestem, little	50	40	25b	50	40	40	55	50	20	35b	35	50	50	35
Bluestem, silver	10b	15b	---	---	15a	5c	---	15b	---	---	5c	---	5b	---
Bluestem, splitbeard	---	---	---	---	T	5c	5c	---	---	---	---	5b	5b	5d
Bristlegrass, knotroot	10b	---	10c	---	---	---	---	---	---	10c	---	---	5b	---
Buffalograss	10b	5c	10c	5b	---	---	---	---	---	10c	---	---	---	---
Canada wildrye	---	15b	35a	15a	---	---	---	15b	---	---	---	---	---	---
Carolina jointtail	10b	---	10c	---	T	5c	---	---	---	10c	---	---	5b	---
Crinkleawn	---	---	---	---	---	---	10a	---	---	---	---	10a	---	---
Dropseed, meadow	---	---	---	15a	---	---	---	---	---	---	---	---	---	---
Dropseed, sand	---	---	---	---	---	---	5c	---	---	---	---	---	---	5d
Dropseed, tall	10b	15b	---	---	15a	---	---	15b	15a	10c	5b	5b	5b	5d
Eastern gamagrass	10b	---	25b	---	---	---	---	---	15a	35b	---	---	10a	---
Fall witchgrass	10b	5c	---	5b	15a	---	---	---	---	---	---	5b	5b	---
Grama, hairy	---	---	---	---	T	---	---	---	---	---	5c	---	---	---
Grama, sideoats	10b	15b	---	15a	15a	5c	---	15b	---	---	5b	---	5b	---
Green silkyscale	---	---	---	---	---	---	---	---	---	---	---	---	5b	---
Indiangrass, slender	---	---	---	---	---	---	---	---	---	---	---	---	---	15a
Indiangrass, yellow	25a	30a	25b	10	10	20a	10a	20a	15a	35b	10a	10	10	5b
Longleaf uniola	---	---	10c	---	---	10b	---	---	15b	10c	---	---	10a	15a
Lovegrass, mourning	---	5c	---	---	---	---	---	---	---	---	---	5b	5b	---
Lovegrass, plains	---	---	---	---	---	---	---	---	---	---	5c	---	---	---
Lovegrass, purple	---	---	---	---	---	---	5c	---	---	---	5c	5b	5b	15c
Lovegrass, red	---	---	---	---	---	---	---	---	---	---	---	---	---	15c
Lovegrass, sand	---	---	---	---	---	10b	10a	---	---	---	5b	10a	---	5b
Nimblewill muhly	---	---	10c	---	---	---	---	---	---	---	---	---	---	---
Pan American balsamscale	---	---	---	---	---	---	---	---	---	---	---	5b	5b	---
Panicum, beaked	---	---	25b	---	---	20a	---	---	20	35b	10a	10a	10a	---
Panicum, gaping	---	---	---	---	---	---	---	---	---	10c	---	---	---	---

TABLE 7.--POTENTIAL PLANT COMMUNITY--Continued

Plant species	Range sites													
	Black-land	Clay Loam	Clayey Bottom-land	Claypan Prairie	Claypan Savannah	Deep Red-land	Deep Sand	Eroded Black-land	Flat-woods	Loamy Bottom-land	Sand-stone Hills	Sandy	Sandy Loam	Very Deep Sand
GRASSES AND GRASS-LIKES (Continued)														
Panicums, low	---	5c	10c	5b	15a	5c	10b	15b	15b	10c	---	5b	5b	---
Panicum, redtop	---	---	10c	---	---	---	---	---	---	10c	---	---	---	---
Paspalum, brownseed	---	---	---	5b	10	---	---	---	5	10c	---	10a	10a	---
Paspalum, Florida	10b	15b	25b	15a	15a	10b	---	15b	15a	---	---	---	---	---
Paspalum, fringeleaf	---	---	---	---	---	---	---	---	---	---	---	5b	---	---
Paspalums, low	10b	---	---	---	15a	5c	10b	---	---	10c	---	---	5b	---
Paspalum, rustyseed	---	---	35a	---	---	---	---	---	---	25a	---	---	---	---
Plumegrass	---	---	---	---	---	---	---	---	15a	35b	---	---	---	---
Purpletop	---	5c	---	5b	15a	10b	10a	---	15a	35b	15	10a	---	15a
Sedges	10b	5c	35a	5b	15a	5c	---	15b	15b	25a	5c	5b	5b	---
Switchgrass	10b	15b	25b	15a	15a	---	10a	15b	15a	35b	---	10a	10a	5b
Texas cupgrass	10b	---	---	15a	---	---	---	---	---	---	---	---	---	---
Texas wintergrass	10b	15b	---	15a	15a	---	---	15b	---	10c	5c	---	---	---
Threeawn, arrowfeather	---	---	---	---	15a	---	---	---	---	---	---	---	5b	---
Threeawn, purple	---	---	---	---	---	---	---	---	---	---	5c	---	---	---
Threeawn, woollysheath	---	---	---	---	---	---	5c	---	---	---	---	5b	---	15c
Tridens, longspike	10b	5c	10c	5b	---	---	---	---	---	---	---	---	---	---
Tridens, white	10b	---	---	---	---	---	---	---	---	---	---	---	---	---
Twoflower melic	---	---	10c	---	---	---	---	---	---	10c	---	---	---	---
Vine mesquite	10b	---	25b	15a	---	---	---	15b	---	35b	5c	---	---	---
Virginia wildrye	10b	---	35a	15a	---	---	---	15b	15b	25a	---	---	---	---
FORBS														
Blacksamson	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Bluebonnets	T	---	---	T	---	---	---	T	---	---	---	---	T	---
Bullnettle	---	---	---	---	---	---	T	---	---	---	---	---	---	T
Bundleflower	10c	5d	---	10c	5b	5d	---	10c	---	---	---	---	5c	---
Butterfly-pea	---	---	---	---	5b	---	---	---	---	---	---	---	---	---
Button-snakeroot	10c	---	---	---	---	---	---	10c	---	---	---	---	---	---
Croton	T	---	---	---	T	T	T	T	---	---	---	T	T	T
Crownbeard	---	---	T	---	---	---	---	---	---	---	---	---	---	---
Dayflower	---	---	---	---	5b	5d	5d	---	---	---	10d	5c	5c	5e
Englemann daisy	10c	5d	---	10c	5b	---	---	10c	---	---	---	---	5c	---

TABLE 7.--POTENTIAL PLANT COMMUNITY--Continued

Plant species	Range sites													
	Blackland	Clay Loam	Clayey Bottomland	Claypan Prairie	Claypan Savannah	Deep Redland	Deep Sand	Eroded Blackland	Flatwoods	Loamy Bottomland	Sandstone Hills	Sandy	Sandy Loam	Very Deep Sand
FORBS (Continued)														
Evening primrose	---	---	---	---	---	---	---	---	---	---	---	---	T	---
Fern acacia	10c	---	---	---	---	---	---	---	---	---	---	---	---	---
Gaura	T	---	---	10c	---	---	---	T	---	---	---	---	---	---
Gayfeather	10c	5d	5d	10c	5b	---	---	10c	5c	5d	---	---	5c	---
Goldenrod	---	---	---	---	T	---	---	---	T	---	---	---	---	---
Halfshrub sundrop	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Herbaceous mimosa	---	---	---	---	5b	---	---	---	---	---	---	---	5c	---
Indian paintbrush	T	---	---	T	---	---	---	T	---	---	---	---	T	---
Indianwheat plantain	T	T	---	T	---	---	---	T	---	---	---	---	---	---
Ironweed	---	---	T	---	---	---	---	---	T	T	---	---	---	---
Larkspur	T	---	---	T	---	---	---	T	---	---	---	---	---	---
Lespedezas	---	---	5d	---	5b	5d	5d	---	5c	---	10d	5c	5c	5e
Maximilian sunflower	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Milkweeds	T	---	---	T	---	---	---	T	---	---	---	---	---	---
Partridge pea	10c	5d	---	10c	---	T	5d	10c	5c	5d	---	T	T	5e
Penstemon	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Phlox	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Pidgeonwings	---	---	---	---	5b	---	---	---	---	---	10d	---	---	---
Prairie-clover	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Prairie gentian	T	---	---	---	---	---	---	---	---	---	---	---	---	---
Prairieparsley	T	T	---	T	---	---	---	T	---	---	---	---	---	---
Ragweed, blood	---	---	T	---	---	---	---	---	T	T	---	---	---	---
Ragweed, western	T	T	---	T	T	T	T	T	---	---	---	T	T	T
Scurfpea	10c	5d	---	10c	---	---	---	10c	---	---	---	---	---	---
Sensitive brier	10c	5d	---	10c	5b	5d	---	10c	---	---	10d	5c	5c	---
Skullcaps	T	---	---	T	---	---	---	T	---	---	---	---	---	---
Snakecotton	---	---	---	---	---	---	T	---	---	---	---	---	---	T
Snoutbeans	10c	5d	5d	10c	5b	5d	5d	10c	5c	5d	10d	5c	5c	5e
Snow-on-the-prairie	T	T	---	---	---	---	---	T	---	---	---	---	---	---
Spiderwort	---	---	---	---	5b	5d	5d	---	---	---	---	5c	5c	5e
Tephrosia	---	---	---	---	5b	---	---	---	5c	---	---	5c	5c	---
Tickclover	10c	5d	5d	10c	5b	5d	5d	10c	5c	5d	10d	5c	5c	5e
Verberas	T	---	---	T	---	---	---	T	---	---	---	---	---	---
Vetch	10c	5d	---	10c	5b	---	---	10c	---	---	---	---	---	---
Western indigo	10c	5d	---	10c	---	---	---	10c	---	---	---	5c	---	---

TABLE 7.--POTENTIAL PLANT COMMUNITY--Continued

Plant species	Range sites													
	Blackland	Clay Loam	Clayey Bottomland	Claypan Prairie	Claypan Savannah	Deep Redland	Deep Sand	Eroded Blackland	Flatwoods	Loamy Bottomland	Sandstone Hills	Sandy	Sandy Loam	Very Deep Sand
FORBS (Continued)														
Wild beans	10c	5d	5d	10c	5b	5d	5d	10c	---	5d	10d	5c	5c	5e
Winecups	T	---	---	T	---	---	---	T	---	---	---	---	---	---
Woollywhite	T	---	---	T	---	---	---	T	---	---	---	T	---	---
Yankeeweed	---	---	---	---	---	---	T	---	---	---	10d	---	---	T
Yellow neptunia	10c	5d	---	10c	5b	5d	---	10c	---	---	10d	---	5c	---
WOODY PLANTS														
Alabama supplejack	---	---	25e	---	5d	5f	---	---	5e	25e	---	5e	5e	---
American beautyberry	---	---	---	---	5d	5f	5f	---	5e	---	5f	5e	5e	---
Ash	---	---	---	---	---	---	---	---	---	25e	---	---	---	---
Black willow	---	---	25e	---	---	---	---	---	---	25e	---	---	---	---
Bumelia	5d	T	---	5e	---	---	---	5d	---	---	---	---	---	---
Carolina jessamine	---	---	---	---	---	5f	---	---	5e	---	---	---	---	---
Coralberry	5d	T	---	5e	---	---	---	5d	---	---	5f	---	---	---
Cottonwood	---	---	25e	---	---	---	---	---	---	25e	---	---	---	---
Dewberry	---	---	25e	---	---	5f	5f	---	---	---	5f	5e	5e	5g
Elbowbush	---	T	---	---	5d	---	---	---	---	---	---	---	5e	---
Elm	5d	5e	25e	5e	5d	5f	---	5d	15d	25e	---	---	5e	---
Elm, water	---	---	---	---	---	---	---	---	---	25e	---	---	---	---
Elm, winged	---	---	---	---	---	---	---	---	---	---	---	5e	---	---
Grape	---	---	25e	---	5d	5f	---	---	5e	25e	---	5e	5e	5g
Greenbrier	---	---	25e	---	5d	5f	5f	---	5e	25e	5f	5e	5e	5g
Hackberry	5d	5e	25e	5e	5d	5f	---	5d	---	25e	---	---	5e	---
Hawthorns	---	---	25e	---	5d	5f	5f	---	15d	25e	---	5e	5e	5g
Hickory	---	---	---	---	---	---	---	---	15d	25e	---	---	5e	15f
Honeysuckle	---	---	25e	---	5d	5f	---	---	5e	25e	---	5e	5e	---
Oak, blackjack	---	---	---	---	15c	15e	10e	---	---	---	15e	15d	15d	15f
Oak, bluejack	---	---	---	---	---	---	10e	---	---	---	---	5e	---	15f
Oak, live	5d	---	---	---	---	---	---	5d	---	---	---	---	---	---
Oak, post	---	5e	---	5d	15c	15e	10e	---	15d	---	15e	15d	15d	15f
Oak, red	---	---	---	---	---	15e	---	---	15d	25e	---	---	15d	---
Oak, water	---	---	25e	---	---	---	---	---	15d	25e	---	---	---	---
Oak, willow	---	---	25e	---	---	---	---	---	15d	25e	---	---	---	---
Pecan	---	5e	25e	---	---	---	---	---	---	25e	---	---	---	---
Peppervine	---	---	25e	---	---	---	---	---	5e	25e	---	5e	5e	---
Pricklypear	---	---	---	---	---	---	---	---	---	---	---	---	---	T
Sassafras	---	---	---	---	---	---	5f	---	---	---	---	---	---	---

TABLE 7.--POTENTIAL PLANT COMMUNITY--Continued

Plant species	Range sites													
	Black-land	Clay Loam	Clayey Bottom-land	Claypan Prairie	Claypan Savannah	Deep Red-land	Deep Sand	Eroded Black-land	Flat-woods	Loamy Bottom-land	Sand-stone Hills	Sandy	Sandy Loam	Very Deep Sand
FORBS (Continued)														
St. Andrews cross	---	---	---	---	---	---	---	---	---	---	5f	---	---	---
Sumac	---	T	---	---	---	---	---	---	---	---	---	---	---	---
Sweetgum	---	---	---	---	---	---	---	---	15d	---	---	---	---	---
Sycamore	---	---	---	---	---	---	---	---	---	25e	---	---	---	---
Trumpetcreeper	---	---	25e	---	---	---	---	---	5e	---	---	---	---	---
Wild plum	---	---	---	---	---	---	---	---	---	---	---	5e	---	---
Yaupon	---	---	---	---	5d	5f	5f	---	5e	---	---	5e	5e	5g
Yucca	---	---	---	---	---	---	---	---	---	---	---	---	---	T

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
As------------------ Ashford	4W	Slight	Severe	Severe	Severe	Water oak-----------	70	54	Water oak.
						Willow oak----------	70	54	
						Southern red oak----	60	54	
						Post oak------------	---	---	
AtB, AtD------------ Attoyac	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	90	330	Loblolly pine, American sycamore, black walnut.
						Shortleaf pine------	84	271	
						Sweetgum------------	90	207	
						Southern red oak----	80	109	
BnB----------------- Bienville	10S	Slight	Moderate	Moderate	Slight	Loblolly pine-------	96	460	Loblolly pine.
						Shortleaf pine------	75	173	
						Southern red oak----	---	---	
CuE----------------- Cuthbert	8C	Moderate	Moderate	Slight	Slight	Loblolly pine-------	84	230	Loblolly pine.
						Shortleaf pine------	68	173	
CxE----------------- Cuthbert	6F	Moderate	Moderate	Slight	Moderate	Loblolly pine-------	70	130	Loblolly pine, shortleaf pine.
						Shortleaf pine------	60	87	
						Southern red oak----	---	---	
						Post oak------------	---	---	
De------------------ Derly	4W	Slight	Severe	Moderate	Severe	Water oak-----------	70	54	Water oak, sweetgum, willow oak.
						Willow oak----------	72	57	
						Sweetgum------------	---	---	
Df: Derly--------------	4W	Slight	Severe	Moderate	Severe	Water oak-----------	70	54	Water oak, sweetgum, willow oak.
						Willow oak----------	72	57	
						Sweetgum------------	---	---	
						Southern red oak----	---	---	
Rader---------------	8Wb	Slight	Moderate	Moderate	Moderate	Loblolly pine-------	85	230	Loblolly pine, water oak.
						Southern red oak----	72	78	
						Shortleaf pine------	---	---	
ErC----------------- Elrose	9A	Slight	Slight	Slight	Slight	Loblolly pine-------	89	330	Loblolly pine, shortleaf pine.
						Shortleaf pine------	85	271	
						Sweetgum------------	90	207	
						Southern red oak----	---	---	
FoC----------------- Flo	8S	Slight	Severe	Moderate	Moderate	Loblolly pine-------	80	230	Loblolly pine, shortleaf pine.
						Shortleaf pine------	72	173	
						Post oak------------	---	---	
						Southern red oak----	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
GaA Garner	8Wa	Slight	Severe	Severe	Severe	Loblolly pine Shortleaf pine Southern red oak Willow oak Sweetgum Post oak	80 --- --- --- --- ---	230 --- --- --- --- ---	Loblolly pine.
Gw Gowker	11W	Slight	Severe	Moderate	Slight	Loblolly pine Water oak Willow oak Eastern cottonwood Southern red oak Sweetgum	100 100 100 100 --- ---	460 216 216 283 --- ---	Loblolly pine, water oak, eastern cottonwood.
Ha Hatliff	9W	Slight	Moderate	Moderate	Moderate	Loblolly pine Slash pine Sweetgum Water oak Willow oak	95 --- --- --- ---	330 --- --- --- ---	Loblolly pine, eastern cottonwood.
Kg: Kaufman	5W	Slight	Moderate	Severe	Severe	Water oak Willow oak Eastern cottonwood American sycamore Pecan	73 75 --- --- ---	58 --- --- --- ---	Water oak, pecan.
Gladewater	5W	Slight	Severe	Moderate	Severe	Water oak Willow oak Eastern cottonwood American sycamore Pecan	82 84 --- --- ---	112 117 --- --- ---	Water oak, sweetgum.
KrB Kirvin	8A	Slight	Slight	Slight	Slight	Loblolly pine Shortleaf pine Southern red oak Sweetgum	83 72 --- ---	230 173 --- ---	Loblolly pine, shortleaf pine.
KsB Kirvin	6F	Moderate	Moderate	Slight	Slight	Loblolly pine Shortleaf pine Southern red oak Sweetgum	70 60 --- ---	130 87 --- ---	Loblolly pine.
LaC Larue	8S	Slight	Moderate	Moderate	Moderate	Loblolly pine Shortleaf pine	80 70	330 173	Loblolly pine, shortleaf pine.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
LmB Lummus	8Wb	Slight	Moderate	Slight	Moderate	Loblolly pine	80	230	Loblolly pine, shortleaf pine.
						Shortleaf pine	70	173	
						Southern red oak	70	78	
						Sweetgum	80	117	
Na Nahatche	11W	Slight	Severe	Moderate	Slight	Loblolly pine	100	460	Loblolly pine, eastern cottonwood, water oak.
						Water oak	100	216	
						Willow oak	100	216	
						Eastern cottonwood	100	283	
						Sweetgum	---	---	
						Pecan	---	---	
OkB Oakwood	9A	Slight	Slight	Slight	Slight	Loblolly pine	91	330	Loblolly pine.
						Shortleaf pine	---	---	
						Sweetgum	---	---	
						Southern red oak	---	---	
						Hickory	---	---	
PkC, PkD Pickton	8S	Slight	Slight	Moderate	Moderate	Loblolly pine	80	230	Loblolly pine.
						Shortleaf pine	70	173	
Rd: Rader	8Wb	Slight	Moderate	Moderate	Moderate	Loblolly pine	85	230	Loblolly pine, water oak.
						Southern red oak	72	78	
						Post oak	---	---	
						Blackjack oak	---	---	
						Hickory	---	---	
Derly	4W	Slight	Severe	Moderate	Severe	Water oak	70	54	Water oak, sweetgum, willow oak.
						Willow oak	72	57	
						Southern red oak	---	---	
						Sweetgum	---	---	
						Hickory	---	---	
TcE: Tenaha	8S	Slight	Slight	Moderate	Slight	Loblolly pine	80	230	Loblolly pine.
						Shortleaf pine	69	173	
						Southern red oak	---	---	
						Post oak	---	---	
Cuthbert	8C	Moderate	Moderate	Slight	Slight	Loblolly pine	84	230	Loblolly pine.
						Shortleaf pine	68	173	
						Southern red oak	---	---	
						Post oak	---	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	Productivity class*	
ToC: Tonkawa	5S	Slight	Moderate	Severe	Slight	Loblolly pine	60	60	Loblolly pine, shortleaf pine.
						Shortleaf pine	55	32	
						Post oak	---	---	
						Blackjack oak	---	---	
TrB: Trawick	8C	Slight	Moderate	Slight	Slight	Loblolly pine	80	230	Loblolly pine, shortleaf pine.
						Shortleaf pine	70	173	
						Post oak	---	---	
						Southern red oak	---	---	
						Sweetgum	---	---	
TxE:									
Trawick	8C	Slight	Moderate	Slight	Slight	Loblolly pine	80	230	Loblolly pine.
						Shortleaf pine	70	173	
Bub	6F	Moderate	Moderate	Moderate	Slight	Loblolly pine	70	130	Loblolly pine, shortleaf pine.
						Shortleaf pine	60	87	
WoC: Wolfpen	8S	Slight	Slight	Moderate	Moderate	Loblolly pine	85	230	Loblolly pine, shortleaf pine.
						Shortleaf pine	76	173	
						Southern red oak	---	---	
						Post oak	---	---	
						Sweetgum	---	---	
						Hickory	---	---	
WtC, WtD: Woodtell	8C	Slight	Moderate	Moderate	Moderate	Loblolly pine	80	230	Loblolly pine.
						Shortleaf pine	65	87	
						Southern red oak	---	---	
						Post oak	---	---	

* Productivity class is the average yearly growth in board feet (Doyle Rule) per acre over a 50 year period for fully stocked natural stands.

TABLE 9.--WOODLAND UNDERSTORY VEGETATION

[The woodland ordination symbol for each soil is shown at the end of each map unit description and in table 8. Absence of an entry indicates that the named plant does not occur on the soil]

Woodland ordination symbols	4W		5S		5W		6F		8A		8C		8S		8Wa		8Wb		9A		9W		10S		11W	
Canopy cover (percent)	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55
Plant species	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
GRASSES																										
Bluestem, big	---	---	---	---	0-5	0-5	0-5	0-5	0-10	0-5	0-10	0-10	0-5	0-5	0-5	0-5	---	---	0-10	0-10	---	---	0-10	0-5	0-5	0-5
Bluestem, broomsedge	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Bluestem, bushy	0-5	0-5	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5
Bluestem, Elliott	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Bluestem, fineleaf	---	---	0-5	0-5	---	---	0-10	0-10	0-5	0-5	0-10	0-10	0-5	0-10	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Bluestem, pinehill	50+	25-50	50+	50+	50+	0-10	50+	50+	50+	50+	50+	50+	50+	50+	50+	0-10	50+	25-50	50+	50+	50+	50+	50+	50+	50+	50+
Bluestem, slender	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Bluestem, splitbeard	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Carpetgrass	0-5	0-5	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---
Crabgrass, shaggy	---	---	0-10	0-10	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---
Dropseed, pineywoods	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-10	0-5	0-10	0-5	0-10	---	---	---	---	0-5	0-10	---	---	0-5	0-10	---	---
Dropseed, slender	---	---	0-5	0-5	---	---	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Gamagrass, eastern	0-10	---	---	---	0-10	0-5	---	---	---	---	---	---	---	---	0-10	5-10	0-10	---	0-5	0-5	0-10	0-5	---	---	0-10	0-5
Indiangrass, yellow	---	---	---	---	---	---	0-5	0-5	0-10	0-5	0-10	0-10	---	---	---	---	---	---	0-10	0-5	---	---	0-10	0-5	---	---
Indiangrass, slender	---	---	0-10	0-10	---	---	---	---	---	---	---	---	0-10	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---
Jointtail, Carolina	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Lovegrass, purple	---	---	0-5	0-10	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Muhly, cutover	0-10	0-10	---	---	---	---	---	---	0-5	0-5	0-10	0-10	---	---	---	---	0-10	0-10	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5
Panicum, beaked	0-10	0-10	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-10	0-10	0-5	0-5	0-10	0-10	---	---	0-10	0-10
Panicum, low	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Panicum, spreading	0-10	0-10	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-10	0-10	0-5	0-5	0-10	0-10	---	---	0-10	0-10
Paspalum, brownseed	0-5	0-5	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	0-10	0-10	0-10	0-10	---	---	0-10	0-10
Paspalum, Florida	0-5	0-5	---	---	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	0-5
Paspalum, fringeleaf	---	---	0-10	0-10	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Switchcane	0-10	0-5	---	---	10-25	10-25	---	---	---	---	---	---	---	---	10-25	10-25	0-10	0-10	---	---	0-5	0-5	---	---	0-5	0-5
Switchgrass	0-5	0-10	---	---	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	---	---	0-5	0-5
Threeawn	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Tridens, longspike	0-5	0-5	---	---	0-10	0-5	---	---	---	---	0-5	0-5	---	---	0-10	0-5	0-5	0-5	---	---	0-5	0-5	---	---	0-5	0-5
Tridens, pinebarren	---	---	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	0-5	0-5	---	---	---	---	0-5	0-5
Tridens, purpletop	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Uniola, longleaf	---	0-10	---	---	---	---	---	0-10	---	0-10	---	0-10	---	0-10	---	---	---	0-10	---	0-10	---	0-10	---	0-10	---	0-10
Wildrye, Canada	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
or Virginia	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
SEDGES																										
Carex species	0-5	0-10	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
RUSHES	0-5	0-5	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	---	0-5	0-5	0-5	---	---	0-5	0-5
FORBS																										
Brackenfern	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	0-5	0-5
Bullnettle	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	---	---	---	---	---	---
Croton	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Gayfeather	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	---	0-5	0-5	0-5	---	0-5	0-5	0-5	---
Goldaster, grass-leaf	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---

TABLE 9.--WOODLAND UNDERSTORY VEGETATION--Continued

Woodland ordination symbols	4W		5S		5W		6F		8A		8C		8S		8Wa		8Wb		9A		9W		10S		11W	
Canopy cover (percent)	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55	0-20	36-55
Plant species	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct
FORBS (Continued)																										
Goldenrod	0-5	---	---	---	0-5	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	0-5	---	0-5	0-5	0-5	---	0-5	0-5	0-5	---
Lespedeza, common	---	---	---	---	0-5	---	0-5	0-5	---	---	0-5	0-5	---	---	0-5	---	---	---	---	---	0-5	---	---	---	0-5	---
Palmetto	0-10	0-10	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	---	---	0-5	0-5	---	---	0-5	0-5
Partridge pea	---	---	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Poke	0-5	0-5	---	---	0-5	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Ragweed, western	0-5	---	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	0-5	0-5	0-5	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Smartweed	0-5	0-5	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	---	---	0-5	0-5	---	---	0-5	0-5
Snakecotton	0-5	0-5	10-25	10-25	---	---	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	---	---	---	---	---	---	---	---
Snakeroot, white	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
St. Andrews cross	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Sunflower, swamp	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Tephrosia, Virginia	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	---	---	---	---	---	---
Ticklover	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Yucca	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	---	---	---	---	---	---	---	---	---	---	---	---	---
SHRUBS																										
Beautyberry, American	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Blackgum	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Coralberry	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Cyrilla, swamp	---	0-5	---	---	---	0-5	---	---	---	---	---	---	---	---	---	0-5	---	0-5	---	---	---	0-5	---	---	---	0-5
Dogwood	---	---	0-5	0-10	---	---	---	0-5	---	0-5	---	0-5	0-5	0-10	---	---	---	---	---	0-5	---	---	---	0-5	---	0-5
Hawthorn	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Holly, American	0-5	0-10	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	---	---	0-5	0-5
Huckleberry	---	0-5	---	---	---	---	---	0-5	---	0-5	---	0-5	---	0-5	---	---	---	0-5	---	0-5	---	0-5	---	0-5	---	0-5
Maple, red	---	0-5	---	---	---	0-5	---	---	---	---	---	0-5	---	---	---	0-5	---	0-5	---	0-5	---	0-5	---	---	---	0-5
Oak, bluejack	---	---	10-25	10-25	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	---	---	0-5	0-5	---	---
Plum, flatwoods	---	---	---	0-5	---	---	---	---	---	---	---	---	---	0-5	---	---	---	---	---	---	---	---	---	---	---	---
Sassafras	---	---	0-5	0-10	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-5	---	---	0-5	0-5	---	---
Sumac	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Waxmyrtle	0-10	0-10	---	---	0-10	0-10	---	---	0-5	0-5	---	---	---	---	0-10	0-10	0-10	0-10	0-5	0-5	0-10	0-10	---	---	0-10	0-10
Yaupon	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-10	0-5	0-10	0-5	0-10	0-5	0-10
VINES																										
Blackberry	0-5	0-5	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Dewberry	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Grape, muscadine	---	0-5	---	---	---	0-5	---	0-5	---	0-5	---	0-5	---	---	---	0-5	---	0-5	---	0-5	---	0-5	---	0-5	---	0-5
Grape, summer	---	---	0-5	0-10	---	---	---	---	---	---	---	---	0-5	0-5	---	---	---	---	---	---	---	---	---	---	---	---
Greenbrier	0-5	0-10	---	---	0-5	0-10	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-10	0-5	0-10	0-5	0-10	0-5	0-10	0-5	0-5	0-5	0-10
Honeysuckle	0-5	0-10	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Jessamine, Carolina	0-5	0-5	---	---	---	---	0-5	0-5	0-5	0-5	---	---	---	---	---	---	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5
Jessamine, yellow	---	---	---	---	---	---	---	---	---	---	0-5	0-5	0-5	0-5	---	---	---	---	0-5	0-10	---	---	---	---	---	---
Poison ivy	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Supplejack, Alabama	0-5	0-5	---	---	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
Average annual production (lb/acre air-dry)	4,000	1,750	2,500	1,000	3,300	1,200	2,800	1,700	3,000	1,500	3,800	1,800	3,100	1,200	3,300	1,200	4,000	1,700	2,900	1,200	1,200	1,600	2,000	1,200	4,000	1,500

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ArC Arenosa	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
As Ashford	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.
AtB Attoyac	Slight	Slight	Slight	Slight	Slight.
AtD Attoyac	Slight	Slight	Severe: slope.	Slight	Slight.
AxA, AxB Axtell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Moderate: droughty.
AxD Axtell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
BeB Benchley	Slight	Slight	Moderate: slope.	Slight	Slight.
BeC Benchley	Slight	Slight	Severe: slope.	Slight	Slight.
BnB Bienville	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty.
BuA Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
BuB Burleson	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey.	Moderate: too clayey.	Severe: too clayey.
ChB Chazos	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
CrB Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
CrD Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
CuB: Crockett	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Wilson	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
[illegible] Cuthbert	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
[illegible] Cuthbert	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
[illegible] Derly	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
[illegible]: Derly	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
[illegible] Dimebox	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
[illegible] Dutek	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: droughty.
[illegible]	Slight	Slight	Moderate: slope.	Slight	Slight.
[illegible] Eufaula	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
[illegible] Ferris	Moderate: percs slowly, too clayey.	Moderate: too clayey, percs slowly.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Severe: too clayey.
[illegible] Ferris	Moderate: slope, percs slowly, too clayey.	Moderate: slope, too clayey, percs slowly.	Severe: slope.	Moderate: too clayey.	Severe: too clayey.
[illegible]	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
[illegible]	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
[illegible]	Severe: percs slowly, too clayey, wetness.	Severe: too clayey, percs slowly, wetness.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
[illegible]	Slight	Slight	Moderate: slope.	Slight	Slight.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GfD Gasil	Slight	Slight	Severe: slope.	Slight	Slight.
Gg Gladewater	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness.	Severe: wetness, too clayey.	Severe: wetness, too clayey.
Gh Gladewater	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
Gp Gladewater	Severe: flooding, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding, too clayey.
Gw Gowker	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Ha Hatliff	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
HeB Hearne	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
HeE Hearne	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
HgF Hearne	Moderate: small stones, slope.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Moderate: small stones, large stones, slope.
HuF Hearne	Severe: too clayey.	Severe: too clayey.	Severe: slope, too clayey.	Severe: too clayey.	Severe: too clayey.
JeF: Jedd	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones.	Severe: small stones, large stones, slope.
Margie	Slight	Slight	Severe: slope.	Slight	Slight.
Kg Kaufman	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, percs slowly.	Severe: too clayey.	Severe: too clayey.
Kf Kaufman	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Kg:					
Kaufman	Severe: flooding, percs slowly, too clayey.	Severe: too clayey, percs slowly.	Severe: too clayey, flooding, percs slowly.	Severe: too clayey.	Severe: flooding, too clayey.
Gladewater	Severe: flooding, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, flooding.	Severe: wetness, too clayey.	Severe: wetness, flooding, too clayey.
KrB Kirvin	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope.	Slight	Slight.
[illegible] Kirvin	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones.
[illegible] Larue	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
[illegible] Lexton	Slight	Slight	Moderate: small stones, slope.	Slight	Slight.
[illegible] Lufkin	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness. erodes easily.	Severe: wetness.
[illegible] [illegible]	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly, slope.	Moderate wetness.	Moderate: wetness.
[illegible] Mabank	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
[illegible] Margie	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
[illegible] Margie	Slight	Slight	Severe: slope.	Slight	Slight.
[illegible]:					
Margie	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Gullied land.					
[illegible] [illegible]	Slight	Slight	Moderate: small stones, slope.	Slight	Slight.
[illegible] [illegible]	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight	Severe: small stones.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ms------------------- Melhomes	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Na------------------- Nahatche	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Nu------------------- Nugent	Severe: flooding.	Slight----------	Moderate: small stones, flooding.	Slight----------	Moderate: droughty, flooding.
OkB------------------ Oakwood	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
PaC------------------ Padina	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
PaD------------------ Padina	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
PkC------------------ Pickton	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
PkD------------------ Pickton	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
RaB------------------ Rader	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
Rd: Rader----------------	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
Derly----------------	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
RoC------------------ Robco	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
RmC: Robco----------------	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: slope, small stones, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, droughty.
Gullied land.					
SaB------------------ Silawa	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SaD------------------- Silawa	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
SdB------------------- Silstid	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
TaB------------------- Tabor	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight----------	Slight.
TcE:					
Tenaha----------------	Moderate: too sandy, slope.	Moderate: too sandy, slope.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
Cuthbert--------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
ToC------------------- Tonkawa	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
TrB------------------- Trawick	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
TxE:					
Trawick---------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
[illegible]------------------	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Slight----------	Severe: small stones, depth to rock.
[illegible]------------------- Wilson	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
[illegible]------------------- Wolfpen	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: droughty, too sandy.
[illegible]------------------- Woodtell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Slight.
[illegible]------------------- Woodtell	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
ArC----------------- Arenosa	Poor	Poor	Fair	Fair	---	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
As------------------ Ashford	Fair	Fair	Good	Fair	---	---	Good	Good	Fair	Fair	Good	---
AtB----------------- Attoyac	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
AtD----------------- Attoyac	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
AxA, AxB------------ Axtell	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
AxD----------------- Axtell	Poor	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
BeB, BeD------------ Benchley	Good	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
BnB----------------- Bienville	Fair	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
BuA, BuB------------ Burleson	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.
ChB----------------- Chazos	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
CrB----------------- Crockett	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
CrD----------------- Crockett	Poor	Fair	Good	---	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
CsB:												
Crockett-----------	Fair	Good	Good	---	---	Good	Poor	Poor	Good	---	Poor	Good.
Wilson-------------	Fair	Fair	Good	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
CuB----------------- Cuthbert	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
CuE----------------- Cuthbert	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
De------------------ Derly	Fair	Fair	Good	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Poor.
Df:												
Derly--------------	Fair	Fair	Good	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Poor.
Raino--------------	Fair	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
DnB----------------- Dimebox	Good	Good	Poor	---	---	Poor	Very poor.	Very poor.	Fair	---	Very poor.	Poor.

TABLE 11.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
DuC Dutek	Poor	Fair	Good	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Good.
ErC Elrose	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
EuB Eufaula	Fair	Fair	Fair	Fair	---	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
FeB Ferris	Fair	Good	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
FeD Ferris	Poor	Fair	Fair	---	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
FnC Flo	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
FyC Flynn	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
GaA Garner	Fair	Fair	Fair	Fair	Fair	Fair	Poor	Fair	Fair	Fair	Poor	Fair.
GfB, GfD Gasil	Good	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
[illegible], Gh, Gp Gladewater	Poor	Fair	Fair	Fair	---	Poor	Poor	Good	Fair	Fair	Fair	Poor.
[illegible] Gowker	Poor	Fair	Fair	Good	---	Good	Poor	Poor	Fair	Good	Poor	Fair.
[illegible] Hatliff	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
[illegible], HeE Hearne	Fair	Good	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
[illegible] Hearne	Poor	Fair	Good	---	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
[illegible] Hearne	Poor	Fair	Good	---	---	Fair	Very poor.	Very poor.	Good	---	Very poor.	Fair.
[illegible]: [illegible]	Poor	Fair	Fair	---	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
[illegible]	Fair	Good	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
[illegible] Kaufman	Fair	Fair	Poor	Good	---	Fair	Poor	Good	Fair	Good	Fair	Poor.
[illegible] Kaufman	Poor	Poor	Fair	Good	---	Fair	Poor	Good	Poor	Good	Fair	Fair.
[illegible]: Kaufman	Poor	Poor	Fair	Good	---	Fair	Poor	Good	Poor	Good	Fair	Fair.
Gladewater	Poor	Fair	Fair	Fair	---	Poor	Poor	Good	Fair	Fair	Fair	Poor.

TABLE 11.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
KrB----------------- Kirvin	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
KsB----------------- Kirvin	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
LaC----------------- Larue	Poor	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---
LeB----------------- Lexton	Good	Good	Fair	Good	---	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
LfA----------------- Lufkin	Fair	Good	Fair	Good	Good	Fair	Fair	Fair	Fair	Good	Fair	Fair.
LmB----------------- Lummus	Fair	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
MaA----------------- Mabank	Fair	Good	Good	---	---	Fair	Fair	Fair	Good	---	Fair	Fair.
MgB----------------- Margie	Good	Good	Fair	Good	---	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
MgD----------------- Margie	Fair	Good	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
MHC:												
Margie--------------	Good	Good	Fair	Good	---	Fair	Poor	Very poor.	Good	Good	Very poor.	Fair.
Gullied land.												
MkB, MrB------------ Marquez	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Ms------------------ Melhomes	Very poor.	Poor	Fair	---	---	Poor	Fair	Good	Poor	---	Fair	Poor.
Na------------------ Nahatche	Fair	Fair	Fair	Good	Fair	Fair	Poor	Fair	Fair	Good	Poor	Fair.
Nu------------------ Nugent	Fair	Poor	Fair	Fair	Poor	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
OkB----------------- Oakwood	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
PaC----------------- Padina	Fair	Good	Fair	Fair	---	Fair	Poor	Very poor.	Fair	Fair	Very poor.	Fair.
PaD----------------- Padina	Poor	Fair	Fair	Fair	---	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
PkC, PkD------------ Pickton	Poor	Fair	Good	Fair	Fair	---	Poor	Very poor.	Fair	Fair	Very poor.	---
RaB----------------- Rader	Fair	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.

TABLE 11.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
RD:												
Rader	Fair	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
Derly	Fair	Fair	Good	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Poor.
RoC Robco	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
RsC:												
Robco	Fair	Fair	Good	Good	---	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
Gullied land.												
SaB, SaD Silawa	Fair	Good	Good	Good	---	Good	Poor	Very poor.	Good	Good	Very poor.	Good.
[illegible] Silstid	Poor	Poor	Fair	Poor	Poor	Good	Poor	Very poor.	Poor	Poor	Very poor.	Fair.
TaB Tabor	Fair	Good	Good	Good	---	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
[illegible]												
Tenaha	Poor	Fair	Good	Good	Good	---	Very poor.	Very poor.	Fair	Good	Very poor.	---
Cuthbert	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
[illegible] Tonkawa	Poor	Poor	Fair	Poor	Poor	---	Very poor.	Very poor.	Poor	Poor	Very poor.	---
[illegible] Trawick	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Very poor.	---
[illegible]												
Trawick	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---
[illegible]	Poor	Poor	Fair	Fair	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
[illegible] Wilson	Fair	Fair	Good	---	---	Fair	Fair	Fair	Fair	---	Fair	Fair.
[illegible] Wolfpen	Poor	Fair	Good	Good	Good	---	Poor	Very poor.	Fair	Good	Very poor.	---
[illegible] Woodtell	Good	Good	Good	Good	Good	---	Poor	Very poor.	Good	Good	Poor	---
[illegible] Woodtell	Fair	Good	Good	Good	Good	---	Very poor.	Very poor.	Good	Good	Very poor.	---

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallw excavatons	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ArC Arenosa	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
As Ashford	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell, low strength.	Severe: ponding, too clayey.
AtB Attoyac	Slight	Slight	Slight	Slight	Moderate: low strength.	Slight.
AtD Attoyac	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Slight.
AxA, AxB Axtell	Moderate: too claye.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
AxD Axtell	Moderate: too claye, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: droughty, slope.
BeB, BeD Benchley	Moderate: too claye.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
BnB Bienville	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Slight	Moderate: droughty.
BuA, BuB Burleson	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
ChB Chazos	Moderate: too claye.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
CrB, CrD Crockett	Moderate: too claye.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
CsB: Crockett	Moderate: too claye.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Wilson	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
CuD Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
[illegible]----------------- Cuthbert	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
[illegible]----------------- Derly	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
[illegible]: Derly------------	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
Rader------------	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
[illegible]--------------- Dimebox	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
[illegible]--------------- Dutek	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
[illegible]--------------- Elrose	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
[illegible]--------------- Eufaula	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: droughty.
[illegible]--------------- Ferris	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
[illegible]--------------- Ferris	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: too clayey.
[illegible]--------------- [illegible]	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
[illegible]--------------- [illegible]	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
[illegible]--------------- [illegible]	Severe: cutbanks cave, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell, wetness.	Severe: too clayey.
[illegible]--------------- [illegible]	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
[illegible]--------------- [illegible]	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gg---------------- Gladewater	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, too clayey.
Gh---------------- Gladewater	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding, too clayey.
Gp---------------- Gladewater	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding, too clayey.
Gw---------------- Gowker	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Ha---------------- Hatliff	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
HeB--------------- Hearne	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
HeE--------------- Hearne	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: droughty, slope.
HsE--------------- Hearne	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Moderate: small stones, large stones, slope.
HxE--------------- Hearne	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, slope.	Severe: slope.	Severe: low strength.	Severe: too clayey.
JmE:						
Jedd--------------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, large stones, slope.
Margie------------	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Ka---------------- Kaufman	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: too clayey.
Kf---------------- Kaufman	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
[illegible]: Kaufman	Severe: cutbanks cave, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Severe: flooding, too clayey.
Gladewater	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness, flooding, too clayey.
[illegible] Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
[illegible] Kirvin	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: small stones.
[illegible] Larue	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
[illegible] Leton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
[illegible] Lufkin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
[illegible] [illegible]	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
[illegible] Mabank	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
[illegible] Margie	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
[illegible] Margie	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
[illegible]: Margie	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Gullied land.						
[illegible] Marquez	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
[illegible] Marquez	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Severe: small stones.
[illegible] [illegible]	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.

TABLE 1[illegible].--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Na Nahatche	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Nu Nugent	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
OkB Oakwood	Moderate: wetness.	Slight	Moderate: wetness.	Slight	Moderate: low strength.	Slight.
PaC Padina	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
PaD Padina	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
PkC Pickton	Severe: cutbanks cave.	Slight	Moderate: wetness.	Moderate: slope.	Slight	Moderate: droughty.
PkD Pickton	Severe: cutbanks cave.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
RaB Rader	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
Rd: Rader	Severe: wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness.	Moderate: wetness.	Slight.
Derly	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
RoC Robco	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness, droughty.
RxC: Robco	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness, shrink-swell.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness, droughty.
Gullied land.						
SaB Silawa	Slight	Slight	Slight	Slight	Slight	Slight.
SaD Silawa	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
SdB Silstid	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
[illegible]----- Tabor	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
[illegible]:						
Tenaha-----	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Cuthbert-----	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: droughty.
[illegible]----- Tonkawa	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight-----	Severe: droughty.
[illegible]----- Trawick	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
[illegible]:						
Trawick-----	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
[illegible]-----	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Severe: small stones, depth to rock.
[illegible]----- Wilson	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
[illegible]----- Wolfpen	Severe: cutbanks cave.	Slight-----	Moderate: wetness.	Moderate: slope.	Slight-----	Moderate: droughty, too sandy.
[illegible]----- Woodtell	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
[illegible]----- Woodtell	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ArC Arenosa	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
As Ashford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
AtB Attoyac	Slight	Moderate: seepage.	Slight	Slight	Good.
AtD Attoyac	Slight	Severe: slope.	Slight	Slight	Good.
AxA, AxB Axtell	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
AxD Axtell	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
BeB, BeD Benchley	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BnB Bienville	Moderate: wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Fair: too sandy.
BuA Burleson	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BuB Burleson	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
ChB Chazos	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CrB Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CrD Crockett	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
CsB: Crockett	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

TABLE 13.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
[illegible]: Wilson	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
[illegible], CxE Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
[illegible] Derly	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
[illegible]: Derly	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Rader	Severe: wetness, percs slowly.	Slight	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
[illegible] Dimebox	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
[illegible] Dutek	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
[illegible] Elrose	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
[illegible] Eufaula	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
[illegible] Ferris	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
[illegible] Ferris	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
[illegible] Fls	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
[illegible] Flynn	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
[illegible] Garner	Severe: percs slowly, wetness.	Slight	Severe: too clayey, wetness.	Moderate: wetness.	Poor: too clayey, hard to pack.
[illegible], GfD Gasil	Slight	Moderate: seepage, slope.	Slight	Slight	Good.

TABLE 13.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Gg, Gh: Gladewater	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
Gp: Gladewater	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
Gw: Gowker	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness, thin layer.
Ha: Hatliff	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
HeB: Hearne	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
HeE, HsE, HxE: Hearne	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
JmE:					
Jedd	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
Margie	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Ka, Kf: Kaufman	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Kg:					
Kaufman	Severe: flooding, wetness, percs slowly.	Slight	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack.
Gladewater	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
KrB, KsB: Kirvin	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
LaC: Larue	Severe: poor filter.	Severe: seepage.	Slight	Severe: seepage.	Good.

TABLE 13.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
LeB----- Lexton	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
LfA----- Lufkin	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
LmB----- L[illegible]us	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
MaA----- Mabank	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
MgB, MgD----- Margie	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
MbC: Margie-----	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Gullied land.					
MxB, MrB----- Marquez	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
Me----- Melhomes	Severe: flooding, wetness, poor filter.	Severe: seepage, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, wetness, seepage.	Poor: seepage, too sandy, wetness.
Na----- Nahatche	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Nu----- Nugent	Severe: flooding, wetness.	Severe: seepage, flooding.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage.	Poor: seepage.
OkB----- Oakwood	Severe: wetness, percs slowly.	Severe: seepage.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
PaC----- Padina	Severe: poor filter.	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
PaE----- Padina	Severe: poor filter.	Severe: seepage, slope.	Moderate: slope, too sandy.	Severe: seepage.	Poor: seepage.
PkC----- Pickton	Severe: poor filter.	Severe: seepage.	Severe: wetness, too sandy.	Severe: seepage.	Poor: too sandy.

TABLE 13.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PkD Pickton	Severe: poor filter.	Severe: seepage, slope.	Severe: wetness, too sandy.	Severe: seepage.	Poor: too sandy.
RaB Rader	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Rd:					
Rader	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Derly	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
RoC Robco	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
RxC:					
Robco	Severe: wetness, percs slowly, poor filter.	Severe: seepage.	Severe: wetness, too clayey.	Severe: seepage.	Poor: too clayey, hard to pack.
Gullied land.					
SaB, SaD Silawa	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
SdB Silstid	Slight	Severe: seepage.	Moderate: too sandy.	Severe: seepage.	Poor: seepage.
TaB Tabor	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
TcE:					
Tenaha	Severe: percs slowly, poor filter.	Severe: seepage, slope.	Moderate: slope.	Severe: seepage.	Fair: too sandy, slope.
Cuthbert	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
ToC Tonkawa	Severe: poor filter.	Severe: seepage.	Severe: too sandy, seepage.	Severe: seepage.	Poor: too sandy, seepage.
TrB Trawick	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey.

TABLE 13.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TxE:					
Trawick	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: depth to rock, too clayey, slope.
Bub	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
WcA Wilson	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
WnC Wolfpen	Severe: poor filter.	Severe: seepage.	Severe: wetness.	Severe: seepage.	Fair: too clayey.
WtC Woodtell	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
WtD Woodtell	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
ArC Arenosa	Good	Probable	Improbable: too sandy.	Poor: too sandy.
As Ashford	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
AtB, AtD Attoyac	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AxA, AxB, AxD Axtell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BeB, BeD Benchley	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
BnB Bienville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
BuA, BuB Burleson	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ChB Chazos	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CrB, CrD Crockett	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CsB:				
Crockett	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Wilson	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
CuE Cuthbert	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CxE Cuthbert	Fair: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
De Derly	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
Df:				
Derly	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
DmA Dimebox	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
DuC Dutek	Good	Probable	Improbable: too sandy.	Fair: too sandy.
ErC Elrose	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
EuB Eufaula	Good	Probable	Improbable: too sandy.	Fair: too sandy.
FeB, FeD Ferris	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
FoC Flo	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
FyC Flynn	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, too clayey.
GaA Garner	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
GfB, GfD Gasil	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Gg, Gh, Gp Gladewater	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Gw Gowker	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ha Hatliff	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness, too sandy.
HeB, HeE Hearne	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
[illegible] Hearne	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, too clayey.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
HxF Hearne	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
JmE:				
Jedd	Poor: depth to rock, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Margie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Ka, Kf Kaufman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Kg:				
Kaufman	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gladewater	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
KrB, KsB Kirvin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LaC Larue	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
LeB Lexton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
LfA Lufkin	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
LmB Lummus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
MaA Mabank	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MgB, MgD Margie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
MhC:				
Margie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Gullied land.				
MkB Marquez	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
MrB Marquez	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, small stones.
Ms Melhomes	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Na Nahatche	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Nu Nugent	Good	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
OkB Oakwood	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
PaC Padina	Good	Probable	Improbable: too sandy.	Fair: too sandy.
PaD Padina	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
PkC, PkD Pickton	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: too sandy.
RaB Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Rd: Rader	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Derly	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
RoC Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
RxC: Robco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, small stones.
Gullied land.				
SaB, SaD Silawa	Good	Probable	Probable	Fair: too clayey, small stones, area reclaim.
SdB Silstid	Good	Probable	Improbable: too sandy.	Fair: too sandy.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
TaB------------------ Tabor	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TcE:				
Tenaha---------------	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy, slope.
Cuthbert-------------	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
ToC------------------ Tonkawa	Good-----------------	Probable-------------	Improbable: too sandy.	Poor: too sandy.
TrB------------------ Trawick	Fair: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
TxE:				
Trawick--------------	Fair: depth to rock, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Bub------------------	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, too clayey, small stones.
WcA------------------ Wilson	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
WoC------------------ Wolfpen	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
WtC, WtD------------- Woodtell	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
ArC Arenosa	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.
As Ashford	Slight	Severe: ponding, hard to pack.	Percs slowly, ponding.	Ponding, percs slowly.	Wetness, percs slowly.
AtB, AtD Attoyac	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable.
AxA, AxB Axtell	Slight	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly.	Erodes easily, droughty.
AxD Axtell	Slight	Severe: hard to pack.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
BeB, BeD Benchley	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly.
BnB Bienville	Severe: seepage.	Severe: piping, seepage.	Deep to water	Too sandy, soil blowing.	Droughty.
BuA, BuB Burleson	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly.
ChB Chazos	Slight	Moderate: hard to pack.	Deep to water	Soil blowing, percs slowly.	Percs slowly.
CrB, CrD Crockett	Slight	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
CsB: Crockett	Slight	Severe: hard to pack.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Wilson	Slight	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
[illegible] Cuthbert	Slight	Moderate: piping.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
[illegible] Cuthbert	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope.
De Derly	Slight	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

TABLE 15.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
Df: Derly	Slight	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Rader	Slight	Moderate: hard to pack, wetness.	Percs slowly	Wetness, soil blowing, percs slowly.	Percs slowly.
DmA Dimebox	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly.
DuC Dutek	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.
ErC Elrose	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable	Favorable.
EuB Eufaula	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Droughty.
FeB Ferris	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly.
FeD Ferris	Slight	Severe: hard to pack.	Deep to water	Slope, percs slowly.	Slope, percs slowly.
FoC Flo	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Droughty.
FyC Flynn	Moderate: seepage.	Moderate: piping.	Deep to water	Soil blowing	Favorable.
GaA Garner	Slight	Severe: hard to pack.	Deep to water	Percs slowly	Percs slowly.
GfB, GfD Gasil	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Favorable.
Gg, Gh Gladewater	Slight	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
Gp Gladewater	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Wetness, percs slowly.
Gw Gowker	Moderate: seepage.	Severe: wetness.	Percs slowly, flooding.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
Ha Hatliff	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
HeB Hearne	Slight	Moderate: piping.	Deep to water	Percs slowly	Percs slowly.

TABLE 15.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
[illegible], HsE----------- Hearne	Slight------------	Moderate: piping.	Deep to water----	Slope, percs slowly.	Slope, percs slowly.
[illegible]----------- Hearne	Slight------------	Moderate: piping.	Deep to water----	Percs slowly, slope.	Percs slowly, slope.
[illegible]:					
Jedd--------------	Moderate: depth to rock.	Severe: large stones.	Deep to water----	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Margie------------	Slight------------	Severe: hard to pack.	Deep to water----	Erodes easily, soil blowing.	Erodes easily.
Ka, [illegible]------------ Kaufman	Slight------------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Percs slowly.
[illegible]:					
Kaufman-----------	Slight------------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Percs slowly.
Gladewater--------	Slight------------	Severe: hard to pack, wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
[illegible]---------------- Kirvin	Slight------------	Severe: hard to pack.	Deep to water----	Erodes easily----	Erodes easily.
[illegible]---------------- Kirvin	Slight------------	Severe: hard to pack.	Deep to water----	Favorable--------	Favorable.
[illegible]---------------- Larue	Severe: seepage.	Severe: thin layer.	Deep to water----	Soil blowing-----	Droughty.
[illegible]---------------- [illegible]	Slight------------	Severe: hard to pack.	Deep to water----	Favorable--------	Favorable.
[illegible]---------------- Lufkin	Slight------------	Severe: hard to pack, wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
[illegible]---------------- [illegible]	Slight------------	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Percs slowly, erodes easily.
[illegible]---------------- Mabank	Slight------------	Severe: wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
[illegible], MgD----------- Margie	Slight------------	Severe: hard to pack.	Deep to water----	Erodes easily, soil blowing.	Erodes easily.
[illegible]:					
Margie------------	Slight------------	Severe: hard to pack.	Deep to water----	Erodes easily, soil blowing.	Erodes easily.
Gullied land.					

TABLE 15.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
MkB Marquez	Slight	Moderate: hard to pack.	Deep to water	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
MrB Marquez	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly.
Ms Melhomes	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, too sandy.	Wetness.
Na Nahatche	Moderate: seepage.	Severe: wetness.	Flooding	Wetness	Wetness.
Nu Nugent	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy	Droughty.
OkB Oakwood	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Deep to water	Soil blowing	Favorable.
PaC Padina	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing	Droughty.
PaD Padina	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, soil blowing.	Slope, droughty.
PkC Pickton	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.
PkD Pickton	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
RaB Rader	Slight	Moderate: hard to pack, wetness.	Percs slowly	Wetness, soil blowing, percs slowly.	Percs slowly.
Rd: Rader	Slight	Moderate: hard to pack, wetness.	Percs slowly	Wetness, soil blowing, percs slowly.	Percs slowly.
Derly	Slight	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
RoC Robco	Severe: seepage.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, droughty, percs slowly.
RxC: Robco	Severe: seepage.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, droughty, percs slowly.
Gullied land.					

TABLE 15.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
SaB, SaD--------- Silawa	Severe: seepage.	Moderate: piping.	Deep to water----	Soil blowing-----	Favorable.
SdB-------------- Silstid	Moderate: seepage.	Severe: seepage, piping.	Deep to water----	Soil blowing-----	Droughty.
TaB-------------- Tabor	Slight-----------	Moderate: hard to pack.	Deep to water----	Erodes easily, soil blowing, percs slowly.	Erodes easily, percs slowly.
TkE: Tenaha-----------	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Slope, soil blowing.	Droughty, slope.
Cuthbert---------	Slight-----------	Moderate: piping.	Deep to water----	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.
ToC-------------- Tonkawa	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Too sandy, soil blowing.	Droughty.
TrB-------------- Trawick	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Deep to water----	Erodes easily----	Erodes easily.
TxE: Trawick----------	Moderate: depth to rock.	Moderate: hard to pack, thin layer.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Ub---------------	Severe: depth to rock.	Severe: thin layer.	Deep to water----	Slope, depth to rock.	Slope, depth to rock.
WcA-------------- Wilson	Slight-----------	Severe: hard to pack, wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
WoC-------------- Wolfpen	Severe: seepage.	Severe: thin layer.	Deep to water----	Favorable--------	Droughty.
WtC-------------- Woodtell	Slight-----------	Severe: hard to pack.	Deep to water----	Erodes easily----	Erodes easily, percs slowly.
WtD-------------- Woodtell	Slight-----------	Severe: hard to pack.	Deep to water----	Slope, erodes easily.	Slope, erodes easily, percs slowly.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. Some soils may have Unified classifications and USDA textures in addition to those shown. In general, the dominant classifications and textures are shown]

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ArC-------------- Arenosa	0-84	Fine sand--------	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	60-100	8-20	<25	NP-3
As--------------- Ashford	0-5	Clay loam--------	CL, CH	A-7-6	0	100	95-100	90-100	80-95	45-60	24-36
	5-80	Clay-------------	CH	A-7-6	0	95-100	95-100	95-100	90-100	55-85	34-55
AtB-------------- Attoyac	0-12	Fine sandy loam	SM-SC, CL-ML, ML, SM	A-4	0	98-100	95-100	70-100	40-65	<23	NP-7
	12-72	Sandy clay loam, loam, fine sandy loam, sandy loam	CL, SC	A-4, A-6	0	98-100	95-100	80-100	36-75	23-40	7-24
AtD-------------- Attoyac	0-13	Fine sandy loam	SM-SC, CL-ML, ML, SM	A-4	0	98-100	95-100	70-100	40-65	<23	NP-7
	13-80	Sandy clay loam, loam, fine sandy loam, sandy loam	CL, SC	A-4, A-6	0	98-100	95-100	80-100	36-75	23-40	7-24
AxA-------------- Axtell	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	9-26	Clay-------------	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	26-58	Clay, sandy clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	58-80	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	95-100	75-100	50-95	35-63	20-45
AxB-------------- Axtell	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	8-18	Clay-------------	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	18-41	Clay, sandy clay	CL, CH	A-7-6	0-2	95-100	95-100	85-100	70-98	41-65	25-42
	41-80	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	95-100	75-100	50-95	35-63	20-45
AxD-------------- Axtell	0-4	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0	90-100	80-100	75-100	28-75	<31	NP-7
	4-26	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	95-100	75-100	75-100	51-98	41-65	25-40
	26-76	Clay, clay loam, sandy clay.	CL, CH	A-7-6	0-2	90-100	75-100	75-100	51-98	41-65	25-40
	76-80	Sandy clay loam, clay loam, clay.	CL, CH, SC	A-6, A-7-6	0-2	85-100	75-100	75-100	36-98	37-70	15-45
BeB-------------- Benchley	0-13	Clay loam--------	CL	A-6, A-7	0	90-100	90-100	80-95	60-80	30-43	11-22
	13-18	Clay loam, clay	CL, CH	A-7	0	90-100	90-100	80-95	70-95	44-66	23-41
	18-60	Clay-------------	CH	A-7	0	95-100	90-100	90-100	75-95	56-75	33-46
	60-80	Stratified shale and sandstone.	CL, CH	A-7	0	95-100	90-100	60-90	50-85	41-60	21-36
BeD-------------- Benchley	0-14	Clay loam--------	CL	A-6, A-7	0	90-100	90-100	80-95	60-80	30-43	11-22
	14-18	Clay loam, clay	CL, CH	A-7	0	90-100	90-100	80-95	70-95	44-66	23-41
	18-55	Clay-------------	CH	A-7	0	95-100	90-100	90-100	75-95	56-75	33-46
	55-80	Stratified shale and sandstone.	CL, CH	A-7	0	95-100	90-100	60-90	50-85	41-60	21-36

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
nB ienville	0-16	Loamy fine sand	SM	A-2-4, A-4	0	100	100	90-100	15-50	<25	NP-3
	16-80	Loamy fine sand, fine sandy loam, fine sand.	SM, ML	A-2-4, A-4	0	100	100	90-100	30-55	<25	NP-3
A urleson	0-19	Clay	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	45-57	28-39
	19-72	Clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	51-72	34-48
B urleson	0-21	Clay	CH, CL	A-7-6	0-2	90-100	90-100	90-99	67-97	45-57	28-39
	21-80	Clay	CH	A-7-6	0-1	90-100	90-100	90-99	80-99	51-72	34-48
B azos	0-17	Loamy fine sand	SM, SM-SC	A-2-4, A-4	0	80-100	80-100	60-98	20-50	<25	NP-4
	17-48	Clay, sandy clay	CL, CH	A-7-6	0	90-100	90-100	90-100	55-85	43-58	21-35
	48-80	Clay, sandy clay, sandy clay loam.	CL, CH	A-7-6, A-6	0	90-100	90-100	80-100	50-80	35-55	15-35
rB rockett	0-7	Fine sandy loam	SM, ML, SM-SC, CL SC, CL-ML	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	7-18	Clay	CH, CL	A-7	0	89-100	85-100	85-100	65-98	45-59	27-42
	18-63	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	85-100	85-100	65-98	40-59	23-42
	63-80	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	53-90	30-60	15-40
rD rockett	0-6	Fine sandy loam	SM, ML, SM-SC, CL SC, CL-ML	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	6-13	Clay	CH, CL	A-7	0	89-100	85-100	85-100	65-98	45-59	27-42
	13-47	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	85-100	85-100	65-98	40-59	23-42
	47-80	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	53-90	30-60	15-40
: rockett	0-6	Loam	SM, ML, SM-SC, CL SC, CL-ML	A-4, A-6	0-2	98-100	94-100	89-100	40-96	15-35	3-15
	6-19	Clay	CH, CL	A-7	0	89-100	85-100	85-100	65-98	45-59	27-42
	19-70	Clay, clay loam, sandy clay.	CH, CL	A-7, A-6	0	89-100	85-100	85-100	65-98	40-59	23-42
	70-80	Clay loam, sandy clay loam, clay.	CL, CH	A-6, A-7	0-5	90-100	85-100	75-100	53-90	30-60	15-40
ilson	0-6	Loam	CL	A-6	0	95-100	85-100	80-100	60-96	26-38	11-20
	6-42	Clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	39-56	22-37
	42-80	Clay	CL, CH	A-7-6, A-6	0	95-100	90-100	85-100	70-96	35-65	24-48

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CuE-------------- Cuthbert	0-6	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0-1	85-100	78-100	75-98	20-55	<32	NP-7
	6-16	Clay-------------	CL, CH	A-6, A-7-6	0-1	95-100	88-100	80-100	55-98	43-63	25-40
	16-24	Sandy clay loam, clay loam.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-1	89-100	85-100	80-100	28-84	29-45	11-26
	24-60	Stratified shale, sandstone, sandy clay loam to shaly clay loam.	SC, CL, ML	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-84	29-45	7-26
CxE-------------- Cuthbert	0-9	Fine sandy loam	SM, SM-SC, CL-ML, ML	A-4	5-10	85-100	78-100	75-98	20-55	<30	NP-6
	9-35	Clay loam, clay loam, sandy clay loam.	CH, CL, SC	A-7, A-6	0-5	90-100	90-100	80-100	45-98	37-63	20-40
	35-60	Stratified shale, sandstone, sandy clay loam to shaly clay loam.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-5	89-100	85-100	80-100	28-84	29-45	11-26
De--------------- Derly	0-13	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	55-90	<30	NP-10
	13-19	Clay, silty clay loam, silty clay	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-60	20-36
	19-40	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	51-70	31-44
	40-80	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	56-70	33-44
Df:											
Derly-----------	0-8	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	55-90	<30	NP-10
	8-15	Clay, silty clay loam, silty clay	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-60	20-36
	15-80	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	56-70	33-44
Rader-----------	0-23	Fine sandy loam	ML, SM, CL, CL-ML, SC, SM-SC	A-2, A-4	0	95-100	95-100	90-100	34-72	18-28	3-10
	23-31	Sandy clay loam, loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	31-64	Sandy clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	64-80	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0	95-100	95-100	90-100	36-75	25-52	11-36
DmA-------------- Dimebox	0-33	Silty clay, clay	CH	A-7-6, A-7-5	0	90-100	90-100	90-100	85-96	51-90	27-55
	33-91	Clay-------------	CH	A-7-6, A-7-5	0	90-100	90-100	85-100	75-96	51-90	30-57

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DuC-------------- Dutek	0-31	Loamy fine sand	SM, SP-SM	A-2, A-3	0	95-100	95-100	85-100	9-25	<22	NP-3
	31-51	Sandy clay loam	CL, SC, SM-SC, CL-ML	A-2, A-4, A-6	0	98-100	95-100	90-100	30-55	24-40	6-20
	51-60	Fine sandy loam, sandy clay loam.	SC, SM-SC, CL-ML, CL	A-2, A-4, A-6	0	95-100	95-100	90-100	22-55	20-40	4-20
	60-84	Loamy fine sand, fine sandy loam.	SM, SM-SC, SP-SM	A-2	0	95-100	95-100	85-100	10-35	<25	NP-7
ErC-------------- Elrose	0-18	Fine sandy loam	SM, SM-SC	A-2-4, A-4	0	85-100	78-95	70-85	30-45	<25	NP-7
	18-45	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	90-100	85-97	80-95	36-65	20-38	8-20
	45-80	Fine sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2-4, A-4	0	90-100	80-90	60-85	25-48	<25	NP-10
EuB-------------- Eufaula	0-9	Loamy fine sand	SM	A-2	0	100	98-100	90-100	15-35	<25	NP-4
	9-80	Loamy fine sand, fine sand, fine sandy loam.	SM, SP-SM	A-2, A-3	0	100	98-100	82-100	5-35	<25	NP-4
FeB-------------- Ferris	0-3	Clay--------------	CH	A-7-6	0	92-100	92-100	75-100	75-100	51-76	35-55
	3-36	Clay--------------	CH	A-7-6	0	92-100	92-100	75-100	72-100	51-78	35-56
	36-68	Shaly clay, clay.	CH	A-7-6	0	92-100	92-100	85-100	75-100	61-100	42-75
FeD-------------- Ferris	0-4	Clay--------------	CH	A-7-6	0	92-100	92-100	75-100	75-100	51-76	35-55
	4-36	Clay, silty clay	CH	A-7-6	0	92-100	92-100	75-100	72-100	51-78	35-56
	36-80	Shaly clay, clay.	CH	A-7-6	0	92-100	92-100	85-100	75-100	61-100	42-75
FhC-------------- Flo	0-17	Loamy fine sand	SM, SP-SM	A-2, A-3	0	98-100	95-100	85-100	5-35	<25	NP-3
	17-84	Loamy fine sand	SM	A-2, A-4	0	98-100	95-100	90-100	15-45	<25	NP-3
FyC-------------- Flynn	0-12	Fine sandy loam, loam.	SM, SM-SC, ML, CL-ML	A-4	0	90-100	85-98	70-85	40-55	<25	NP-7
	12-55	Sandy clay loam, clay loam.	SC, CL	A-6	0	90-100	85-98	80-95	36-75	29-39	10-18
	55-72	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	90-100	80-95	75-95	36-60	25-39	8-16
	72-80	Sandy clay loam, fine sandy loam, loam.	SM, SC, ML, CL, SM-SC, CL-ML	A-2-4, A-4	0-15	85-100	80-95	60-85	25-65	16-30	3-10
GaA-------------- Garner	0-4	Clay--------------	CL, CH	A-7-6	0	95-100	95-100	67-100	65-100	41-58	20-37
	4-65	Clay--------------	CH	A-7-6	0	95-100	95-100	85-100	80-100	51-75	31-51
GrB-------------- Gasil	0-16	Fine sandy loam	CL, ML, CL-ML, SC SM, SM-SC	A-4	0	95-100	95-100	85-100	36-55	20-28	2-10
	16-72	Sandy clay loam, loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0	95-100	90-100	85-100	36-71	22-40	7-20

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GfD--------------- Gasil	0-11	Fine sandy loam	CL, ML, CL-ML, SC SM, SM-SC	A-4	0	95-100	95-100	85-100	36-55	20-28	2-10
	11-72	Sandy clay loam, loam.	CL, SC, CL-ML, SM-SC	A-6, A-4	0	95-100	95-100	85-100	36-71	22-40	7-20
Gg--------------- Gladewater	0-12	Clay--------------	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	12-80	Clay--------------	CH	A-7	0	100	100	95-100	90-100	51-75	30-50
Gh--------------- Gladewater	0-8	Clay--------------	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	8-80	Clay--------------	CH	A-7	0	100	100	95-100	90-100	51-75	30-50
Gp--------------- Gladewater	0-4	Clay--------------	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	4-80	Clay--------------	CH	A-7	0	100	100	90-100	90-100	51-75	30-50
Gw--------------- Gowker	0-24	Clay loam--------	CL, SC	A-6	0	95-100	95-100	85-100	40-80	30-40	11-18
	24-40	Clay loam, sandy clay.	CL	A-6, A-7	0	95-100	95-100	85-100	70-95	38-48	15-21
	40-80	Sandy clay loam, clay loam, loam, sandy loam.	CL, SC	A-6	0	95-100	95-100	80-100	40-90	30-40	11-18
Ha--------------- Hatliff	0-8	Fine sandy loam	SM-SC, SM, ML, CL, CL-ML, SC	A-4	0	100	95-100	65-95	36-55	<30	NP-10
	8-72	Stratified loam to sand.	SP-SM, SM, SC, SM-SC	A-2-4, A-4, A-3	0	100	95-100	50-90	5-45	<30	NP-9
HeB-------------- Hearne	0-7	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-2	75-100	75-100	65-100	36-55	<30	NP-7
	7-27	Clay, sandy clay	CH, CL	A-7	0-1	90-100	85-100	85-100	51-95	40-65	20-40
	27-60	Stratified sandy clay loam to sandstone and shale.	SC, CL	A-6, A-7, A-2	0-3	85-100	85-100	80-100	28-85	29-45	11-26
HeF-------------- Hearne	0-6	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-2	75-100	75-100	65-100	36-55	<30	NP-7
	6-26	Clay, sandy clay	CH, CL	A-7	0-1	90-100	85-100	85-100	51-95	40-65	20-40
	26-70	Stratified sandstone to shale.	SC, CL	A-6, A-7, A-2	0-3	85-100	85-100	80-100	28-85	29-45	11-26
HsE-------------- Hearne	0-7	Fine sandy loam	SM, SM-SC	A-4, A-2, A-1-B	5-10	75-90	60-85	40-60	20-45	<30	NP-7
	7-28	Clay, sandy clay	CH, CL	A-7	0-5	80-100	80-100	65-95	51-85	40-65	20-40
	28-60	Stratified sandstone shale to ironstone.	SC, CL	A-6, A-7, A-2	0-3	85-100	85-100	80-100	28-85	29-45	11-26
HxE-------------- Hearne	0-3	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0-2	75-100	75-100	65-85	36-55	<30	NP-7
	3-36	Clay, sandy clay	CH, CL	A-7	0-1	90-100	85-100	85-100	51-95	40-65	20-40
	36-60	Stratified sandy clay loam to sandstone and shale.	SC, CL	A-6, A-7, A-2	0-3	85-100	85-100	80-100	28-85	29-45	11-26

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
mE:											
Jedd	0-3	Gravelly sandy loam.	GM, SM, GP-GM, SP-SM	A-2-4, A-3, A-1-A, A-1-B	5-10	45-91	35-90	25-87	6-23	<30	NP-7
	3-34	Clay, clay loam.	CL, SC	A-7-6, A-6	0-5	90-100	90-100	70-98	45-60	35-48	15-28
	34-60	Cemented, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Margie	0-5	Loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0-2	80-100	80-100	70-95	30-65	<30	NP-7
	5-52	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	75-100	75-95	51-90	37-56	19-34
	52-80	Variable	---	---	---	---	---	---	---	---	---
Ka, Kf Kaufman	0-8	Clay	CH	A-7	0	100	100	90-100	80-100	56-96	33-62
	8-80	Clay	CH	A-7	0	100	100	95-100	90-100	65-102	45-71
Kg:											
Kaufman	0-12	Clay	CH	A-7	0	100	100	90-100	80-100	56-96	33-62
	12-80	Clay	CH	A-7	0	100	100	95-100	90-100	65-102	45-71
Gladewater	0-8	Clay	CH, CL	A-7	0	100	100	90-100	80-95	48-75	25-50
	8-80	Clay	CH	A-7	0	100	100	95-100	90-100	51-75	30-50
KrB Kirvin	0-9	Fine sandy loam	SM, ML, SM-SC, CL SC, CL-ML	A-4	0-2	85-100	78-98	70-95	36-70	<30	NP-8
	9-45	Sandy clay, clay.	CL, CH	A-7	0-1	95-100	90-100	85-100	53-95	42-67	24-43
	45-60	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-59	16-32
	60-80	Stratified sandy clay loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
KsB Kirvin	0-9	Gravelly fine sandy loam.	SM, GM, SM-SC, SC GM-GC	A-2-4, A-4	0-5	55-92	47-80	40-75	25-49	<30	NP-8
	9-42	Sandy clay, clay.	CL, CH	A-7	0-1	95-100	90-100	85-100	53-95	42-67	24-43
	42-52	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7	0-1	95-100	90-100	75-100	51-90	32-59	16-32
	52-80	Stratified sandy clay loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-90	36-80	25-52	9-32
LaC Larue	0-26	Loamy fine sand	SM	A-2-4	0	100	98-100	50-75	15-30	---	NP
	26-44	Sandy clay loam	SC, SM-SC	A-2-4, A-4, A-6, A-2-6	0	100	95-100	80-90	30-45	20-35	5-12
	44-80	Sandy clay loam, loam, clay loam.	SM, SM-SC, SC	A-2-4, A-4	0	100	95-100	60-70	30-40	20-30	3-10

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LeB-------------- Lexton	0-7	Clay loam---------	SC, CL-ML, CL, SM-SC	A-4, A-6	0	90-100	85-100	65-95	36-65	25-35	6-12
	7-57	Clay, clay loam	CL, CH, MH, ML	A-7	0	90-100	75-98	70-95	51-70	41-60	17-28
	57-80	Variable---------	---	---	---	---	---	---	---	---	---
LfA-------------- Lufkin	0-6	Fine sandy loam	SM, CL, SM-SC, ML SC, CL-ML	A-4	0-5	90-100	80-100	80-100	40-85	<30	NP-10
	6-35	Clay-------------	CH, CL	A-7-6	0	90-100	90-100	90-100	65-95	45-67	30-45
	35-72	Clay-------------	CH, CL	A-7	0	85-100	75-100	70-100	65-90	40-86	25-55
LmB-------------- Lummus	0-24	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	70-95	36-60	<25	NP-7
	24-27	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-4	0	98-100	98-100	80-100	36-75	26-40	8-22
	27-51	Clay, sandy clay	CL, CH	A-6, A-7	0	98-100	98-100	85-100	50-95	34-60	18-40
	51-80	Sandy clay loam, clay loam, clay, sandy clay.	CL, CH, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-60	13-35
MaA-------------- Mabank	0-6	Fine sandy loam	CL, CL-ML, SM-SC, SC	A-4, A-6	0	95-100	95-100	80-98	40-70	19-32	4-15
	6-72	Clay, clay loam	CH, CL	A-7, A-6	0	95-100	95-100	95-100	60-85	38-55	22-37
MgB-------------- Margie	0-10	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0-2	80-100	80-100	70-95	30-65	<30	NP-7
	10-27	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	75-100	75-95	51-90	37-56	19-34
	27-46	Gravelly clay, very gravelly clay.	SC, GC, CL, CH	A-7	0-2	60-90	55-85	50-80	36-65	41-60	18-35
	46-63	Sandy clay loam, clay loam, sandy clay.	CL, CH	A-6, A-7-6	0-2	95-100	65-95	65-95	51-90	32-56	16-30
	63-80	Variable---------	---	---	---	---	---	---	---	---	---
MgD-------------- Margie	0-11	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0-2	80-100	80-100	70-95	30-65	<30	NP-7
	11-60	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	75-100	75-95	51-90	37-56	19-34
MhC:											
Margie----------	0-2	Fine sandy loam	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0-2	80-100	80-100	70-95	30-65	<30	NP-7
	2-34	Sandy clay loam, clay loam, clay.	CL, CH	A-6, A-7-6	0-2	95-100	75-100	75-95	51-90	37-56	19-34
	34-80	Sandy clay loam, clay loam, sandy clay.	CL, CH	A-6, A-7-6	0-2	95-100	65-95	65-95	51-90	32-56	16-30
Gullied land.											

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MkB-------------- Marquez	0-13	Very fine sandy loam.	SM, SM-SC, ML, CL-ML	A-4	0-2	85-100	75-100	65-95	36-65	<30	NP-7
	13-50	Clay, clay loam, sandy clay.	CH, CL	A-7	0-1	95-100	90-100	85-100	51-90	41-65	20-40
	50-80	Stratified sandy clay loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-96	36-93	25-52	9-30
MrB-------------- Marquez	0-10	Gravelly fine sandy loam.	GM, SM	A-2-4, A-4	0-5	55-75	40-75	35-70	25-45	<25	NP-4
	10-48	Clay, clay loam, sandy clay.	CH, CL	A-7	0-1	95-100	90-100	85-100	51-90	41-65	20-40
	48-65	Stratified sandy clay loam to very shaly clay.	SC, CL, CH	A-4, A-6, A-7	0-1	95-100	90-100	50-96	36-93	25-52	9-30
Me--------------- Melhomes	0-10	Loamy fine sand	SP-SM	A-2-4, A-3	0	100	98-100	60-85	5-12	---	NP
	10-70	Loamy fine sand, fine sand.	SP-SM, SP, SM	A-2-4, A-3	0	100	90-100	51-80	3-15	---	NP
Na--------------- Nahatche	0-3	Loam-------------	CL	A-6, A-7, A-4	0	100	100	90-100	54-92	25-47	8-25
	3-25	Loam, clay loam, silty clay loam.	CL	A-6, A-4	0	100	100	85-100	60-90	25-40	8-20
	25-72	Stratified loam to silty clay loam.	CL	A-6, A-7	0	100	100	90-100	60-90	30-45	11-25
Nu--------------- Nugent	0-16	Loamy fine sand	SM, SP-SM	A-2	0	85-100	75-100	50-100	10-30	---	NP
	16-80	Stratified loamy sand to fine sandy loam.	SM, SP-SM	A-2	0	85-100	75-100	60-100	10-30	<25	NP-3
OkB-------------- Oakwood	0-19	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4	0	90-100	90-100	70-90	36-55	<25	NP-7
	19-39	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0	90-100	90-100	80-95	40-75	20-40	8-22
	39-80	Sandy clay loam.	SC, CL	A-4, A-6	0	85-100	85-100	80-95	40-75	20-40	8-22
PaC-------------- Padina	0-58	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	58-80	Sandy clay loam.	SC	A-2, A-4, A-6	0	90-100	90-100	90-100	25-50	22-36	8-20
PaD-------------- Padina	0-42	Loamy fine sand	SM, SP-SM, SM-SC	A-2-4, A-3	0	100	95-100	85-100	8-28	<25	NP-5
	42-80	Sandy clay loam.	SC	A-2, A-4, A-6	0	90-100	90-100	90-100	25-50	22-36	8-20
PkC-------------- Pickton	0-4	Loamy fine sand	SM, SM-SC	A-2-4	0	100	95-100	85-100	15-30	<28	NP-7
	4-66	Loamy fine sand, fine sand.	SM, SM-SC	A-2-4	0	100	95-100	85-100	15-30	<28	NP-7
	66-84	Sandy clay loam.	SC, CL, CL-ML, SM-SC	A-4, A-6, A-2-6, A-2-4	0	100	95-100	85-100	25-75	23-35	5-14

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PkD-------------- Pickton	0-6	Loamy fine sand	SM, SM-SC	A-2-4	0	100	95-100	85-100	15-30	<28	NP-7
	6-48	Loamy fine sand, fine sand.	SM, SM-SC	A-2-4	0	100	95-100	85-100	15-30	<28	NP-7
	48-65	Sandy clay loam.	SC, CL, CL-ML, SM-SC	A-4, A-6, A-2-6, A-2-4	0	100	95-100	85-100	25-75	23-35	5-14
PaB-------------- Rader	0-24	Fine sandy loam	ML, SM, CL CL-ML, SC SM-SC	A-2, A-4	0	95-100	95-100	90-100	34-72	18-28	3-10
	24-30	Sandy clay loam, loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	30-68	Sandy clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	68-80	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0	95-100	95-100	90-100	36-75	25-52	11-36
Rd:											
Rader-----------	0-19	Fine sandy loam	ML, SM, CL CL-ML, SC SM-SC	A-2, A-4	0	95-100	95-100	90-100	34-72	18-28	3-10
	19-29	Sandy clay loam, loam.	SC, CL	A-6	0	95-100	95-100	90-100	36-75	26-40	11-22
	29-42	Sandy clay, clay, clay loam.	CL, CH	A-6, A-7	0	95-100	95-100	90-100	51-90	36-60	18-38
	42-74	Sandy clay loam, sandy clay, clay.	SC, CL, CH	A-6, A-7	0	95-100	95-100	90-100	36-75	25-52	11-36
Derly-----------	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	55-90	<30	NP-10
	9-26	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	100	90-100	70-95	35-60	20-36
	26-66	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	51-70	31-44
	66-84	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	56-70	33-44
RoC-------------- Robco	0-22	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	22-25	Sandy clay loam, loam, clay loam.	SC, CL	A-6, A-4	0	98-100	98-100	80-100	36-75	26-40	8-22
	25-55	Clay, sandy clay	CL, CH	A-6, A-7	0	98-100	98-100	85-100	50-95	36-60	18-40
	55-80	Sandy clay loam, sandy clay, clay, clay loam.	CL, CH, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-60	13-35
RxC:											
Robco-----------	0-26	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	80-100	80-100	65-95	8-35	<25	NP-3
	26-70	Clay, sandy clay	CL, CH	A-6, A-7	0	98-100	98-100	85-100	50-95	36-60	18-40
	70-85	Sandy clay loam, sandy clay, clay.	CL, CH, SC	A-6, A-7	0	98-100	98-100	80-100	40-95	32-60	13-35
Gullied land.											
SaB-------------- Silawa	0-16	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	70-100	40-60	<26	NP-7
	16-55	Sandy clay loam	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-65	25-40	8-18
	55-84	Fine sandy loam, sandy loam, loamy fine sand.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	85-100	80-100	75-100	30-60	21-34	4-14

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SaD-------------- Silawa	0-8	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	95-100	70-100	40-60	<26	NP-7
	8-46	Sandy clay loam	CL, SC	A-4, A-6	0	85-100	85-100	80-100	35-65	25-40	8-18
	46-80	Fine sandy loam, sandy loam, loamy fine sand.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-2-4, A-2-6	0-2	85-100	80-100	75-100	30-60	21-34	4-14
B-------------- Silstid	0-24	Loamy fine sand	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	90-100	9-25	<25	NP-3
	24-64	Sandy clay loam, loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	95-100	80-100	30-55	20-40	4-22
	64-80	Sandy clay loam, loam, fine sandy loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2-4, A-2-6	0	95-100	85-100	70-100	22-55	20-40	4-22
TaB-------------- Tabor	0-16	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4, A-2-4	0	85-100	75-100	70-100	30-55	<25	NP-7
	16-63	Clay-------------	CH, CL	A-7	0	95-100	90-100	85-100	55-90	45-65	25-40
	63-80	Clay, clay loam, sandy clay.	CH, CL, SC	A-7, A-6	0	95-100	90-100	75-100	40-90	35-60	15-35
TcE:											
Tenaha----------	0-5	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	70-95	15-40	<20	NP-3
	5-36	Loamy fine sand	SM	A-2-4, A-4	0	95-100	95-100	70-95	15-40	<20	NP-3
	36-57	Sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-7-6	0	95-100	95-100	80-100	36-65	25-46	8-26
	57-72	Stratified fine sandy loam to very shaly clay and sandstone.	SC, CL	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-60	25-45	11-26
Cuthbert--------	0-9	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-2-4, A-4	0-1	85-100	78-100	75-98	20-55	<32	NP-7
	9-32	Clay-------------	CL, CH	A-6, A-7-6	0-1	95-100	88-100	80-100	55-98	43-63	25-40
	32-60	Stratified shale to sandstone.	SC, CL, ML	A-6, A-7, A-2-6, A-2-7	0-3	89-100	85-100	80-100	28-84	29-45	7-26
C-------------- Tonkawa	0-84	Fine sand, sand	SP-SM	A-3, A-2	0	100	97-100	90-100	6-12	<25	NP-3
B-------------- Trawick	0-6	Fine sandy loam	SC, CL-ML, CL, SM-SC	A-2-4, A-4	0	90-100	90-100	85-95	25-55	20-30	4-10
	6-43	Clay, clay loam	CL, CH	A-7	0	90-100	75-98	70-85	51-75	41-60	18-30
	43-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
E:											
Trawick---------	0-5	Clay loam--------	SC, CL-ML, CL, SM-SC	A-4	0	90-100	90-100	85-95	36-55	20-30	4-10
	5-42	Clay, clay loam	CL, CH	A-7	0	90-100	75-98	70-85	51-75	41-60	18-30
	42-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
b--------------	0-3	Gravelly clay loam.	GC, SC, CL	A-2, A-6, A-4	1-10	35-85	35-85	30-80	30-65	25-40	8-18
	3-18	Clay, gravelly clay, clay loam.	CH, GC, CL, SC	A-7	1-5	50-85	50-85	45-85	36-75	41-60	20-35
	18-80	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WcA-------------- Wilson	0-7	Clay loam--------	CL	A-6, A-7-6	0	95-100	85-100	80-100	60-96	38-49	20-30
	7-80	Clay, clay loam.	CL, CH	A-7-6, A-6	0	90-100	80-100	80-100	65-96	39-56	22-37
WoC-------------- Wolfpen	0-3	Loamy fine sand	SM, SM-SC	A-2-4	0	95-100	95-100	85-100	15-35	<25	NP-7
	3-25	Loamy fine sand, fine sand.	SM, SM-SC	A-2-4	0	95-100	95-100	85-100	15-35	<25	NP-7
	25-55	Sandy clay loam, clay loam.	SC, CL	A-6, A-4, A-2	0	95-100	95-100	85-100	26-55	25-40	8-20
	55-80	Sandy clay loam.	SC, SM, CL, ML, SM-SC, CL-ML	A-4, A-6, A-2, A-7	0	95-100	95-100	85-100	25-55	15-45	2-27
WtC-------------- Woodtell	0-8	Fine sandy loam	CL, SM-SC, CL-ML, ML	A-4, A-6	0-2	95-100	90-100	75-100	40-75	20-33	3-13
	8-48	Clay, sandy clay, clay loam.	CH	A-7-6	0	100	90-100	80-100	60-98	40-75	25-46
	48-60	Stratified sandy loam to shaly clay and sandstone.	CL, CH, SC	A-6, A-7-6	0	85-100	80-100	60-100	36-95	32-76	13-45
WtD-------------- Woodtell	0-10	Fine sandy loam	CL, SM, SM-SC, CL-ML, ML	A-4, A-6	0-2	95-100	90-100	75-100	40-75	20-33	3-13
	10-48	Clay, sandy clay, clay loam.	CH	A-7-6	0	100	90-100	80-100	60-98	40-75	25-46
	48-80	Stratified sandy loam to shaly clay and sandstone.	CL, CH, SC	A-6, A-7-6	0	85-100	80-100	60-100	36-95	32-76	13-45

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
ArC---------------- Arenosa	0-84	1-8	1.40-1.60	>20	0.05-0.08	5.6-6.5	Very low-----	0.15	5	1	<1
As----------------- Ashford	0-5 5-80	30-40 50-75	1.35-1.55 1.40-1.60	0.2-0.6 <0.06	0.15-0.22 0.12-0.18	5.6-6.0 4.5-7.8	High--------- Very high----	0.37 0.32	5	6	.5-2
AtB---------------- Attoyac	0-12 12-72	8-20 18-32	1.30-1.50 1.40-1.65	2.0-6.0 0.6-2.0	0.11-0.15 0.12-0.17	5.6-6.5 5.1-6.0	Low---------- Low----------	0.32 0.32	5	3	<1
AtD---------------- Attoyac	0-13 13-80	8-20 14-32	1.30-1.50 1.40-1.65	2.0-6.0 0.6-2.0	0.11-0.15 0.12-0.17	5.6-6.5 5.1-6.0	Low---------- Low----------	0.32 0.32	5	3	<1
AxA---------------- Axtell	0-9 9-26 26-58 58-80	7-18 35-55 27-50 25-50	1.40-1.60 1.35-1.60 1.50-1.70 1.50-1.70	0.6-2.0 <0.06 <0.06 0.2-0.6	0.11-0.15 0.07-0.16 0.07-0.16 0.07-0.12	5.1-6.0 4.5-5.5 6.6-8.4 5.6-8.4	Low---------- High--------- High--------- High---------	0.43 0.37 0.37 0.37	5	3	.5-1
AxB---------------- Axtell	0-8 8-18 18-41 41-72	7-18 35-55 27-50 25-50	1.40-1.60 1.35-1.60 1.50-1.70 1.50-1.70	0.6-2.0 <0.06 <0.06 0.2-0.6	0.11-0.15 0.07-0.16 0.07-0.16 0.07-0.12	5.1-6.0 4.5-5.5 6.6-8.4 5.6-8.4	Low---------- High--------- High--------- High---------	0.43 0.37 0.37 0.37	5	3	.5-1
AxD---------------- Axtell	0-4 4-26 26-76 76-80	7-18 35-55 27-50 25-50	1.40-1.60 1.35-1.60 1.50-1.70 1.50-1.70	0.6-2.0 <0.06 <0.06 0.2-0.6	0.11-0.15 0.07-0.16 0.07-0.16 0.07-0.12	5.1-6.0 4.5-5.5 6.6-8.4 5.6-8.4	Low---------- High--------- High--------- High---------	0.43 0.37 0.37 0.37	5	3	.5-1
BeB---------------- Benchley	0-13 13-18 18-60 60-80	20-35 30-50 40-55 40-55	1.35-1.55 1.45-1.60 1.55-1.65 1.60-1.70	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.15-0.20 0.12-0.18 0.12-0.18 0.12-0.18	5.6-7.3 5.6-7.3 5.1-8.4 5.1-8.4	Moderate----- High--------- High--------- Moderate-----	0.32 0.32 0.32 0.32	5	6	1-3
BeD---------------- Benchley	0-14 14-18 18-55 55-80	20-35 30-50 40-55 40-55	1.35-1.55 1.45-1.60 1.55-1.65 1.60-1.70	0.6-2.0 0.06-0.2 0.06-0.2 0.06-0.2	0.15-0.20 0.12-0.18 0.12-0.18 0.12-0.18	5.6-7.3 5.6-7.3 5.1-8.4 5.1-8.4	Moderate----- High--------- High--------- Moderate-----	0.32 0.32 0.32 0.32	5	6	1-3
BnB---------------- Bienville	0-16 16-80	5-15 5-20	1.35-1.60 1.35-1.80	2.0-6.0 2.0-6.0	0.08-0.11 0.08-0.13	4.5-6.5 5.1-6.0	Very low----- Very low-----	0.20 0.20	5	2	.5-2
BuA---------------- Burleson	0-19 19-72	40-60 40-60	1.35-1.50 1.40-1.55	<0.06 <0.06	0.12-0.18 0.12-0.18	5.6-8.4 7.4-8.4	Very high---- Very high----	0.32 0.32	5	4	1-3
BuB---------------- Burleson	0-21 21-80	40-60 40-60	1.35-1.50 1.40-1.55	<0.06 <0.06	0.12-0.18 0.12-0.18	5.6-8.4 7.4-8.4	Very high---- Very high----	0.32 0.32	5	4	1-3
ChB---------------- Chazos	0-17 17-48 48-80	5-12 35-50 25-45	1.40-1.65 1.30-1.60 1.40-1.60	2.0-6.0 0.06-0.2 0.06-0.2	0.06-0.10 0.15-0.18 0.15-0.18	5.6-7.3 5.6-6.5 5.6-8.4	Very low----- High--------- Moderate-----	0.20 0.32 0.28	5	2	<1
CrB---------------- Crockett	0-7 7-18 18-63 63-80	5-20 40-60 35-55 20-50	1.50-1.60 1.35-1.60 1.40-1.65 1.50-1.70	0.6-2.0 <0.06 <0.06 <0.06	0.11-0.20 0.14-0.18 0.15-0.18 0.12-0.20	5.6-7.3 5.6-7.3 5.6-8.4 6.1-8.4	Low---------- High--------- High--------- Moderate-----	0.43 0.32 0.32 0.32	5	3	.5-2

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
CrD	0-6	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.3	Low	0.43	5	3	.5-2
Crockett	6-13	40-60	1.35-1.60	<0.06	0.14-0.18	5.6-7.3	High	0.32			
	13-47	35-55	1.40-1.65	<0.06	0.15-0.18	5.6-8.4	High	0.32			
	47-80	20-50	1.50-1.70	<0.06	0.12-0.20	6.1-8.4	Moderate	0.32			
CsB:											
Crockett	0-6	5-20	1.50-1.60	0.6-2.0	0.11-0.20	5.6-7.3	Low	0.43	5	5	.5-2
	6-19	40-60	1.35-1.60	<0.06	0.14-0.18	5.6-7.3	High	0.32			
	19-70	35-55	1.40-1.65	<0.06	0.15-0.18	5.6-8.4	High	0.32			
	70-80	20-50	1.50-1.70	<0.06	0.12-0.20	6.1-8.4	Moderate	0.32			
Wilson	0-6	18-27	1.40-1.65	0.2-0.6	0.15-0.20	5.6-7.3	Low	0.43	5	5	.5-2
	6-42	35-60	1.50-1.70	<0.06	0.14-0.20	5.6-8.4	High	0.37			
	42-80	40-60	1.50-1.70	<0.06	0.12-0.15	6.6-8.4	High	0.37			
CuE	0-6	7-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	Low	0.37	3	3	<1
Cuthbert	6-16	40-55	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	High	0.32			
	16-24	20-50	1.35-1.60	0.2-0.6	0.09-0.15	3.6-5.5	Moderate	0.32			
	24-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate	0.32			
CxE	0-9	7-15	1.45-1.60	2.0-6.0	0.10-0.15	4.5-6.5	Low	0.28	3	8	<1
Cuthbert	9-35	25-60	1.25-1.45	0.2-0.6	0.12-0.18	3.6-5.5	Moderate	0.32			
	35-60	20-45	1.40-1.65	0.2-0.6	0.10-0.15	3.6-5.0	Moderate	0.32			
De	0-13	8-20	1.40-1.60	0.6-2.0	0.13-0.24	4.5-6.5	Low	0.37	5	5	.5-2
Derly	13-19	30-45	1.40-1.55	0.06-0.2	0.15-0.22	4.5-6.0	Moderate	0.37			
	19-40	40-60	1.45-1.60	<0.06	0.12-0.18	4.5-7.3	Very high	0.32			
	40-80	40-60	1.44-1.65	<0.06	0.12-0.18	5.6-7.3	Very high	0.32			
Df:											
Derly	0-8	8-20	1.40-1.60	0.6-2.0	0.13-0.24	4.5-6.5	Low	0.37	5	5	.5-2
	8-15	30-45	1.40-1.55	0.06-0.2	0.15-0.22	4.5-6.0	Moderate	0.37			
	15-80	40-60	1.44-1.65	<0.06	0.12-0.18	5.6-7.3	Very high	0.32			
Rader	0-23	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low	0.32	5	3	.5-2
	23-31	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate	0.32			
	31-64	35-50	1.45-1.70	<0.06	0.12-0.18	4.5-5.5	High	0.32			
	64-80	24-45	1.45-1.70	0.06-0.2	0.12-0.18	5.1-8.4	Moderate	0.32			
DmA	0-33	40-60	1.00-1.35	<0.06	0.12-0.18	4.5-7.3	Very high	0.32	5	4	1-5
Dimebox	33-91	40-60	1.30-1.50	<0.06	0.12-0.18	5.1-8.4	Very high	0.32			
DuC	0-31	3-12	1.30-1.60	6.0-20	0.05-0.10	5.6-6.5	Very low	0.20	5	2	<1
Dutek	31-51	20-35	1.30-1.65	0.6-2.0	0.12-0.17	5.1-6.0	Low	0.24			
	51-60	10-30	1.30-1.65	0.6-6.0	0.10-0.16	4.5-6.0	Low	0.24			
	60-84	5-20	1.30-1.60	2.0-20	0.05-0.10	4.5-6.5	Very low	0.20			
ErC	0-18	3-15	1.25-1.40	2.0-6.0	0.10-0.15	5.6-6.5	Low	0.28	5	3	.5-2
Elrose	18-45	22-35	1.30-1.55	0.6-2.0	0.13-0.18	4.5-6.5	Low	0.32			
	45-80	5-25	1.35-1.65	2.0-6.0	0.10-0.16	4.5-6.5	Low	0.24			
EuB	0-9	2-10	1.35-1.50	6.0-20	0.07-0.11	5.6-6.5	Very low	0.17	5	2	.5-1
Eufaula	9-80	2-12	1.50-1.70	6.0-20	0.07-0.13	5.1-6.5	Very low	0.17			
FeB	0-3	40-60	1.40-1.50	<0.06	0.15-0.18	7.9-8.4	Very high	0.32	4	4	.5-2
Ferris	3-36	40-60	1.40-1.50	<0.06	0.15-0.18	7.9-8.4	Very high	0.32			
	36-68	40-60	1.45-1.65	<0.06	0.11-0.15	7.9-8.4	Very high	0.32			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
FeD---------------- Ferris	0-4 4-36 36-80	40-60 40-60 40-60	1.40-1.50 1.40-1.50 1.45-1.65	<0.06 <0.06 <0.06	0.15-0.18 0.15-0.18 0.11-0.15	7.9-8.4 7.9-8.4 7.9-8.4	Very high---- Very high---- Very high----	0.32 0.32 0.32	4	4	.5-2
FoC---------------- Flo	0-17 17-84	1-6 5-12	1.35-1.60 1.35-1.70	6.0-20 6.0-20	0.05-0.09 0.07-0.14	4.5-6.0 4.5-6.0	Very low----- Very low-----	0.17 0.17	5	2	<1
FyC---------------- Flynn	0-12 12-55 55-72 72-80	3-15 22-35 20-35 10-25	1.35-1.55 1.40-1.60 1.40-1.60 1.40-1.60	2.0-6.0 0.6-2.0 0.6-2.0 0.6-6.0	0.11-0.15 0.13-0.18 0.13-0.18 0.10-0.16	5.6-7.3 5.1-7.3 5.1-7.3 5.1-6.5	Low---------- Low---------- Low---------- Low----------	0.24 0.32 0.32 0.24	5	3	.5-2
GaA---------------- Garner	0-4 4-65	40-55 50-60	1.20-1.45 1.30-1.50	0.06-0.2 <0.06	0.12-0.18 0.12-0.18	5.6-6.5 5.6-8.4	High--------- Very high----	0.32 0.32	5	4	1-4
GfB---------------- Gasil	0-16 16-72	2-20 15-35	1.50-1.60 1.50-1.60	2.0-6.0 0.6-2.0	0.11-0.15 0.12-0.19	5.1-7.3 5.1-6.5	Low---------- Moderate-----	0.24 0.32	5	3	<1
GfD---------------- Gasil	0-11 11-72	2-20 15-35	1.50-1.60 1.50-1.60	2.0-6.0 0.6-2.0	0.11-0.15 0.12-0.19	6.1-7.3 5.1-6.5	Low---------- Moderate-----	0.24 0.32	5	3	<1
Gr----------------- Gladewater	0-12 12-80	40-60 40-60	1.35-1.55 1.40-1.60	0.06-0.2 <0.06	0.15-0.20 0.15-0.18	5.6-7.3 5.1-8.4	Very high---- Very high----	0.32 0.32	5	4	1-3
Gh----------------- Gladewater	0-8 8-80	40-60 40-60	1.35-1.55 1.40-1.60	0.06-0.2 <0.06	0.15-0.20 0.15-0.18	5.6-7.3 5.1-8.4	Very high---- Very high----	0.32 0.32	5	4	1-3
Gp----------------- Gladewater	0-4 4-80	40-60 40-60	1.35-1.55 1.40-1.60	0.06-0.2 <0.06	0.15-0.20 0.15-0.18	5.6-7.3 5.1-8.4	Very high---- Very high----	0.32 0.32	5	4	1-3
Gw----------------- Gowker	0-24 24-40 40-80	28-35 28-40 18-40	1.20-1.50 1.30-1.60 1.30-1.60	0.6-2.0 0.06-0.2 0.2-0.6	0.12-0.20 0.12-0.20 0.12-0.20	5.6-7.3 5.6-7.3 4.5-7.3	Moderate----- Moderate----- Moderate-----	0.32 0.37 0.37	5	6	1-3
Ha----------------- Hatliff	0-8 8-72	8-20 8-18	1.20-1.50 1.20-1.50	2.0-6.0 2.0-6.0	0.11-0.15 0.05-0.11	5.1-6.5 5.1-7.3	Low---------- Low----------	0.28 0.24	5	3	<1
HeB---------------- Hearne	0-7 7-27 27-60	5-15 35-45 20-45	1.20-1.40 1.30-1.50 1.40-1.65	2.0-6.0 0.06-0.2 0.06-0.6	0.11-0.17 0.10-0.15 0.08-0.15	4.5-6.5 3.6-5.5 3.6-5.5	Low---------- High--------- Moderate-----	0.32 0.32 0.32	3	3	<1
HeE---------------- Hearne	0-6 6-26 26-70	5-15 35-45 20-45	1.20-1.40 1.30-1.50 1.40-1.65	2.0-6.0 0.06-0.2 0.06-0.6	0.11-0.17 0.10-0.15 0.08-0.15	4.5-6.5 3.6-5.5 3.6-5.5	Low---------- High--------- Moderate-----	0.32 0.32 0.32	3	3	<1
HhE---------------- Hearne	0-7 7-28 28-60	5-20 35-45 20-45	1.30-1.60 1.30-1.50 1.40-1.65	2.0-6.0 0.06-0.2 0.06-0.6	0.08-0.12 0.10-0.15 0.08-0.15	4.5-6.5 3.6-5.5 3.6-5.5	Low---------- High--------- Moderate-----	0.24 0.32 0.32	3	8	<1
[illegible]---------------- Hearne	0-3 3-36 36-60	5-15 35-45 20-45	1.20-1.40 1.30-1.50 1.40-1.65	2.0-6.0 0.06-0.2 0.06-0.6	0.11-0.17 0.10-0.15 0.08-0.15	4.5-6.5 3.6-5.5 3.6-5.5	Low---------- High--------- Moderate-----	0.32 0.32 0.32	3	8	<1
JeE: Jedd--------------	0-3 3-34 34-60	5-18 40-55 ---	1.20-1.40 1.30-1.50 ---	0.6-2.0 0.2-0.6 ---	0.04-0.14 0.13-0.17 ---	5.6-7.3 4.5-6.5 ---	Low---------- Moderate----- -------------	0.10 0.32 ----	2	8	<1
Margie-------------	0-5 5-52 52-80	6-18 30-50 ---	1.40-1.60 1.45-1.65 ---	0.6-2.0 0.2-0.6 ---	0.08-0.12 0.12-0.18 ---	5.6-7.3 5.1-6.5 ---	Low---------- Moderate----- -------------	0.37 0.32 ----	5	3	<2

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Ka, Kf------------ Kaufman	0-8	50-86	1.40-1.50	<0.06	0.15-0.20	5.6-8.4	Very high----	0.32	5	4	1-4
	8-80	60-86	1.40-1.50	<0.06	0.15-0.18	5.6-8.4	Very high----	0.32			
Kg:											
Kaufman----------	0-12	50-86	1.40-1.50	<0.06	0.15-0.20	5.6-8.4	Very high----	0.32	5	4	1-4
	12-80	60-86	1.40-1.50	<0.06	0.15-0.18	5.6-8.4	Very high----	0.32			
Gladewater-------	0-8	40-60	1.35-1.55	0.06-0.2	0.15-0.20	5.6-7.3	Very high----	0.32	5	4	1-3
	8-80	40-60	1.40-1.60	<0.06	0.15-0.18	5.1-8.4	Very high----	0.32			
KrB-------------- Kirvin	0-9	5-15	1.20-1.40	2.0-6.0	0.11-0.16	5.1-6.5	Low----------	0.37	4	3	<2
	9-45	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	High---------	0.32			
	45-60	25-50	1.35-1.60	0.2-0.6	0.10-0.16	3.6-5.0	Moderate-----	0.32			
	60-80	20-45	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	Moderate-----	0.32			
KsB-------------- Kirvin	0-9	2-15	1.20-1.40	2.0-6.0	0.08-0.12	5.1-6.5	Low----------	0.20	4	8	<2
	9-42	35-60	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	High---------	0.32			
	42-52	25-50	1.35-1.60	0.2-0.6	0.10-0.16	3.6-5.0	Moderate-----	0.32			
	52-80	20-45	1.40-1.65	0.06-0.2	0.08-0.16	3.6-5.0	Moderate-----	0.32			
LaC-------------- Larue	0-26	3-15	1.30-1.50	6.0-20	0.05-0.10	5.6-6.5	Very low-----	0.17	5	2	.5-2
	26-44	20-35	1.40-1.60	0.6-2.0	0.10-0.15	5.1-6.5	Low----------	0.24			
	44-80	15-30	1.40-1.60	0.6-2.0	0.10-0.15	5.1-6.5	Low----------	0.24			
LeB-------------- Lexton	0-7	28-40	1.20-1.50	0.6-2.0	0.12-0.17	5.6-7.3	Low----------	0.32	5	5	.5-2
	7-57	35-55	1.20-1.50	0.2-0.6	0.12-0.14	5.1-6.5	Moderate-----	0.32			
	57-80	---	---	---	---	---	-------------	----			
LfA-------------- Lufkin	0-6	15-20	1.35-1.55	0.6-2.0	0.11-0.18	5.1-6.5	Low----------	0.43	5	3	.5-2
	6-35	40-60	1.40-1.60	<0.06	0.12-0.18	4.5-7.8	Very high----	0.32			
	35-72	40-60	1.30-1.50	<0.06	0.10-0.14	5.6-8.4	High---------	0.37			
LmB-------------- Lummus	0-24	5-15	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low----------	0.32	5	3	<1
	24-27	22-37	1.50-1.65	0.2-0.6	0.12-0.18	5.1-6.5	Moderate-----	0.32			
	27-51	40-60	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.37			
	51-80	30-55	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.8	Moderate-----	0.37			
MaA-------------- Mabank	0-6	10-20	1.50-1.65	0.6-2.0	0.11-0.15	5.6-7.3	Low----------	0.43	5	3	1-2
	6-72	35-50	1.45-1.65	<0.6	0.12-0.18	6.1-8.4	High---------	0.32			
MgB-------------- Margie	0-10	6-18	1.40-1.60	0.6-2.0	0.08-0.12	5.6-7.3	Low----------	0.37	5	3	<2
	10-27	30-50	1.45-1.65	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.32			
	27-46	40-55	1.45-1.65	0.2-0.6	0.06-0.15	5.1-7.3	Moderate-----	0.32			
	46-63	25-45	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.32			
	63-80	---	---	---	---	---	-------------	----			
MgD-------------- Margie	0-11	6-18	1.40-1.60	0.6-2.0	0.08-0.12	5.6-7.3	Low----------	0.37	5	3	<2
	11-60	30-50	1.45-1.65	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.32			
MhC:											
Margie-----------	0-2	6-18	1.40-1.60	0.6-2.0	0.08-0.12	5.6-7.3	Low----------	0.37	5	3	<2
	2-34	30-50	1.45-1.65	0.2-0.6	0.12-0.18	5.1-7.3	Moderate-----	0.32			
	34-80	25-45	1.50-1.70	0.2-0.6	0.12-0.17	5.1-7.3	Moderate-----	0.32			
Gullied land.											
MkB-------------- Marquez	0-13	2-15	1.40-1.60	2.0-6.0	0.11-0.17	4.5-6.5	Low----------	0.37	3	3	<1
	13-50	35-60	1.40-1.60	0.06-0.2	0.10-0.15	4.5-5.5	High---------	0.32			
	50-80	20-45	1.40-1.65	0.06-0.6	0.08-0.15	4.5-5.5	Moderate-----	0.32			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
MrB---------------- Marquez	0-10	2-15	1.30-1.50	2.0-6.0	0.10-0.14	4.5-6.5	Low----------	0.20	3	8	<1
	10-48	35-60	1.30-1.45	0.06-0.2	0.10-0.15	4.5-5.5	High---------	0.32			
	48-65	20-45	1.40-1.65	0.06-0.6	0.08-0.15	4.5-5.5	Moderate-----	0.32			
Me---------------- Melhomes	0-10	1-8	1.10-1.30	6.0-20	0.03-0.10	4.5-5.5	Very low-----	0.10	5	8	1-6
	10-70	1-8	1.20-1.40	>20	0.02-0.08	4.5-5.5	Very low-----	0.10			
Na---------------- Nahatche	0-3	18-35	1.10-1.30	0.6-2.0	0.15-0.20	5.6-7.5	Moderate-----	0.28	5	6	1-3
	3-25	18-35	1.20-1.50	0.6-2.0	0.10-0.15	5.1-7.3	Moderate-----	0.28			
	25-72	18-35	1.30-1.60	0.6-2.0	0.10-0.15	5.1-7.3	Moderate-----	0.28			
Nu---------------- Nugent	0-16	2-8	1.20-1.40	6.0-20	0.05-0.10	4.5-6.5	Very low-----	0.17	5	2	.5-2
	16-80	2-10	1.20-1.40	2.0-6.0	0.05-0.10	4.5-6.5	Very low-----	0.17			
OkB--------------- Oakwood	0-19	5-15	1.30-1.50	2.0-6.0	0.10-0.15	5.1-7.3	Low----------	0.32	5	3	<1
	19-39	20-35	1.50-1.70	0.6-2.0	0.15-0.20	4.5-6.5	Low----------	0.32			
	39-80	20-35	1.50-1.70	0.2-0.6	0.15-0.20	4.5-6.5	Low----------	0.28			
PaC--------------- Padina	0-58	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	Very low-----	0.17	5	2	<1
	58-80	20-35	1.40-1.60	0.6-2.0	0.14-0.18	5.1-6.5	Low----------	0.24			
PaD--------------- Padina	0-42	2-10	1.20-1.50	6.0-20	0.05-0.08	5.6-7.3	Very low-----	0.17	5	2	<1
	42-80	20-35	1.40-1.60	0.6-2.0	0.14-0.18	5.1-6.5	Low----------	0.24			
PkC--------------- Pickton	0-4	4-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low----------	0.17	5	2	.5-2
	4-66	3-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low----------	0.17			
	66-84	20-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.24			
PkD--------------- Pickton	0-6	4-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low----------	0.17	5	2	.5-2
	6-48	3-12	1.30-1.60	6.0-20	0.07-0.11	5.6-7.3	Low----------	0.17			
	48-65	20-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low----------	0.24			
RaB--------------- Rader	0-24	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low----------	0.32	5	3	.5-2
	24-30	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-----	0.32			
	30-68	35-50	1.45-1.70	<0.06	0.12-0.18	4.5-7.3	High---------	0.32			
	68-80	24-45	1.45-1.70	0.06-0.2	0.12-0.18	5.1-8.4	Moderate-----	0.32			
Rd: Rader-----------	0-19	5-20	1.40-1.60	2.0-6.0	0.10-0.15	5.1-6.5	Low----------	0.32	5	3	.5-2
	19-29	18-30	1.40-1.60	0.2-0.6	0.12-0.18	4.5-5.5	Moderate-----	0.32			
	29-42	35-50	1.45-1.70	<0.06	0.12-0.18	4.5-6.5	High---------	0.32			
	42-74	24-45	1.45-1.70	0.06-0.2	0.12-0.18	4.5-8.4	Moderate-----	0.32			
Derly-----------	0-9	8-20	1.40-1.60	0.6-2.0	0.13-0.24	4.5-6.5	Low----------	0.37	5	5	.5-2
	9-26	30-45	1.40-1.55	0.06-0.2	0.15-0.22	4.5-6.0	Moderate-----	0.37			
	26-66	40-60	1.45-1.60	<0.06	0.12-0.18	4.5-6.5	Very high----	0.32			
	66-84	40-60	1.44-1.65	<0.06	0.12-0.18	5.6-7.3	Very high----	0.32			
RoC--------------- Robco	0-22	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	Very low-----	0.24	5	2	<1
	22-25	22-37	1.50-1.65	0.2-0.6	0.12-0.18	4.5-6.0	Moderate-----	0.32			
	25-55	40-60	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.37			
	55-80	30-55	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.3	Moderate-----	0.37			
[illegible]: Robco-----------	0-26	2-10	1.40-1.60	6.0-20	0.04-0.10	5.1-6.5	Very low-----	0.24	5	2	<1
	26-70	40-60	1.55-1.70	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.37			
	70-85	30-55	1.55-1.70	0.06-0.2	0.10-0.18	4.5-7.3	Moderate-----	0.37			
Gullied land.											

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
SaB-------------- Silawa	0-16	10-20	1.35-1.55	2.0-6.0	0.10-0.15	5.1-6.5	Low-----------	0.24	5	3	.5-2
	16-55	20-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.32			
	55-84	5-20	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.5	Low-----------	0.32			
SaD-------------- Silawa	0-8	10-20	1.35-1.55	2.0-6.0	0.10-0.15	5.1-6.5	Low-----------	0.24	5	3	.5-2
	8-46	20-35	1.35-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.32			
	46-80	5-20	1.40-1.65	2.0-6.0	0.08-0.15	4.5-6.5	Low-----------	0.32			
SmB-------------- Silstid	0-24	3-12	1.40-1.60	6.0-20	0.05-0.10	5.6-7.3	Very low-----	0.17	5	2	<1
	24-64	18-32	1.50-1.70	0.6-2.0	0.12-0.17	5.1-6.5	Low-----------	0.24			
	64-80	18-32	1.50-1.70	0.6-2.0	0.10-0.16	5.1-6.5	Low-----------	0.24			
TaB-------------- Tabor	0-16	8-20	1.50-1.60	0.6-2.0	0.11-0.15	5.6-6.5	Low-----------	0.43	5	3	<1
	16-63	40-55	1.45-1.65	<0.06	0.14-0.18	4.5-5.5	High----------	0.32			
	63-80	28-45	1.45-1.65	<0.06	0.14-0.18	5.1-8.4	High----------	0.32			
TcE:											
Tenaha-----------	0-5	3-15	1.50-1.65	6.0-20	0.07-0.11	5.1-6.0	Very low-----	0.17	3	2	<1
	5-36	3-15	1.50-1.65	6.0-20	0.07-0.11	5.1-6.0	Very low-----	0.17			
	36-57	22-35	1.50-1.65	0.6-2.0	0.12-0.17	4.5-5.5	Low-----------	0.24			
	57-72	10-30	1.60-1.75	0.2-0.6	0.08-0.14	4.5-5.5	Low-----------	0.24			
Cuthbert---------	0-9	2-15	1.20-1.40	2.0-6.0	0.11-0.15	4.5-6.5	Low-----------	0.37	3	3	<1
	9-32	40-55	1.24-1.45	0.2-0.6	0.10-0.15	3.6-5.5	High----------	0.32			
	32-60	20-45	1.40-1.65	0.06-0.6	0.08-0.15	3.6-5.0	Moderate-----	0.32			
ToC-------------- Tonkawa	0-84	2-8	1.30-1.55	6.0-20	0.04-0.08	4.5-6.5	Very low-----	0.15	5	1	<1
TrB-------------- Trawick	0-6	15-20	1.25-1.45	0.6-2.0	0.11-0.15	5.6-7.3	Low-----------	0.37	4	3	.5-2
	6-43	35-50	1.40-1.60	0.2-0.6	0.12-0.18	4.5-6.0	Moderate-----	0.32			
	43-60	---	---	---	---	---	-------------	----			
TxE:											
Trawick----------	0-5	27-35	1.25-1.45	0.6-2.0	0.11-0.15	5.6-7.3	Low-----------	0.37	4	6	.5-2
	5-42	35-50	1.40-1.60	0.2-0.6	0.12-0.18	4.5-6.0	Moderate-----	0.32			
	42-60	---	---	---	---	---	-------------	----			
Bub--------------	0-3	27-40	1.25-1.45	0.2-0.6	0.08-0.18	5.6-6.5	Low-----------	0.20	2	8	.5-2
	3-18	35-55	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32			
	18-80	---	---	---	---	---	-------------	----			
WcA-------------- Wilson	0-7	27-40	1.35-1.65	0.2-0.6	0.15-0.20	5.6-7.3	Moderate-----	0.43	5	6	.5-2
	7-80	35-60	1.50-1.70	<0.06	0.14-0.20	5.6-8.4	High----------	0.37			
WoC-------------- Wolfpen	0-3	3-12	1.30-1.60	6.0-20	0.07-0.11	5.6-6.5	Low-----------	0.17	5	2	.5-2
	3-25	3-12	1.30-1.65	6.0-20	0.07-0.11	5.6-6.5	Low-----------	0.17			
	25-55	20-30	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.24			
	55-80	20-35	1.30-1.65	0.6-2.0	0.12-0.17	4.5-6.5	Low-----------	0.24			
WtC-------------- Woodtell	0-8	5-20	1.20-1.40	0.6-2.0	0.10-0.15	4.5-6.5	Low-----------	0.43	4	3	<1
	8-48	35-60	1.30-1.50	<0.06	0.12-0.18	4.5-5.5	High----------	0.32			
	48-60	15-50	1.35-1.65	0.06-0.2	0.10-0.15	4.5-7.3	High----------	0.32			
WtD-------------- Woodtell	0-10	5-20	1.20-1.40	0.6-2.0	0.10-0.15	4.5-6.5	Low-----------	0.43	4	3	<1
	10-48	35-60	1.30-1.50	<0.06	0.12-0.18	4.5-5.5	High----------	0.32			
	48-80	15-50	1.35-1.65	0.06-0.2	0.10-0.15	4.5-7.3	High----------	0.32			

TABLE 18.--SOIL AND WATER FEATURES

"Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydro- logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness	Uncoated steel	Concrete
					Ft			In			
C---------------- renosa	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low.
---------------- Ashford	D	None--------	---	---	0-1.0	Perched	Dec-Apr	>60	---	High-----	High.
B, AtD---------- ttoyac	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
A, AxB, AxD----- xtell	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
B, BeD---------- enchley	C	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
---------------- enville	A	None--------	---	---	4.0-6.0	Apparent	Dec-Apr	>60	---	Low------	Moderate.
A, BuB---------- urleson	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
---------------- hazos	C	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
B, CrD---------- ockett	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
: rockett---------	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Low.
lson-----------	D	None--------	---	---	0.5-1.5	Perched	Nov-Mar	>60	---	High-----	High.
, CxE---------- thbert	C	None--------	---	---	>6.0	---	---	>60	---	High-----	High.
---------------- rly	D	None--------	---	---	0-1.5	Perched	Oct-May	>60	---	High-----	High.
rly------------	D	None--------	---	---	0-1.5	Perched	Oct-May	>60	---	High-----	High.
der------------	D	None--------	---	---	2.0-5.0	Perched	Dec-Mar	>60	---	High-----	Moderate.
---------------- ebox	D	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
---------------- tek	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
---------------- rose	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
---------------- aula	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosi	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
FeB, FeD----------- Ferris	D	None---------	---	---	>6.0	---	---	>60	---	High------	Low.
FoC----------------- Flo	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
FyC----------------- Flynn	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
GaA----------------- Garner	D	None---------	---	---	>6.0	---	---	>60	---	High------	Low.
GfB, GfD----------- Gasil	B	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
Gg------------------ Gladewater	D	Occasional	Brief to long.	Nov-May	0-3.5	Apparent	Nov-May	>60	---	High------	Moderate.
Gh------------------ Gladewater	D	Frequent----	Brief to long.	Nov-May	0-3.5	Apparent	Nov-May	>60	---	High------	Moderate.
Gp------------------ Gladewater	D	Frequent----	Long-------	Nov-May	+1-3.0	Apparent	Nov-May	>60	---	High------	Moderate.
Gw------------------ Gowker	C	Frequent----	Brief------	Oct-May	0.5-2.5	Perched	Oct-May	>60	---	High------	Moderate.
Ha------------------ Hatliff	C	Frequent----	Brief------	Nov-May	0-2.0	Apparent	Nov-Mar	>60	---	Low-------	Moderate.
HeB, HeE, HsE------ Hearne	C	None---------	---	---	>6.0	---	---	>60	---	High------	High.
HxE----------------- Hearne	D	None---------	---	---	>6.0	---	---	>60	---	High------	High.
JeE:											
Jedd--------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	High------	Moderate.
Margie------------	C	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate.
Ka------------------ Kaufman	D	Occasional	Brief------	Feb-May	1.5-4.0	Apparent	Nov-Apr	>60	---	High------	Low.
Kf------------------ Kaufman	D	Frequent----	Brief------	Feb-May	1.5-4.0	Apparent	Nov-Apr	>60	---	High------	Low.
Kg:											
Kaufman-----------	D	Frequent----	Brief------	Feb-May	1.5-4.0	Apparent	Nov-Apr	>60	---	High------	Low.
Gladewater--------	D	Frequent----	Brief to long.	Nov-May	0-3.5	Apparent	Nov-May	>60	---	High------	Moderate.
KrB, KsB----------- Kirvin	C	None---------	---	---	>6.0	---	---	>60	---	High------	High.
LaC----------------- Larue	A	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
LeB----------------- Lexton	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
LtA---------------- Lufkin	D	None---------	---	---	0-1.0	Perched	Oct-Mar	>60	---	High-----	Moderate.
LmB---------------- Lummus	C	None---------	---	---	1.5-3.0	Perched	Jan-May	>60	---	High-----	High.
MaA---------------- Mabank	D	None---------	---	---	0.6-1.0	Perched	Dec-Mar	>60	---	High-----	Moderate.
MgB, MgD----------- Margie	C	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
MgC: Margie------------	C	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
Gullied land.											
MkB, MrB----------- Marquez	C	None---------	---	---	>6.0	---	---	>60	---	High-----	High.
Me----------------- Melhomes	D	Frequent----	Brief-----	Dec-May	0-1.0	Apparent	Jan-Dec	>60	---	High-----	High.
Na----------------- Nahatche	C	Frequent----	Brief to long.	Nov-May	0.5-1.5	Apparent	Nov-May	>60	---	High-----	Moderate.
Nu----------------- Nugent	A	Occasional	Brief to long.	Dec-Apr	3.5-6.0	Apparent	Jan-Apr	>60	---	Low------	Moderate.
OkB---------------- Oakwood	B	None---------	---	---	3.5-5.0	Apparent	Jan-Apr	>60	---	High-----	Moderate.
PaC, PaD----------- Padina	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate.
PkC, PkD----------- Pickton	A	None---------	---	---	4.0-6.0	Apparent	Jan-Mar	>60	---	Moderate	High.
RaB---------------- Rader	D	None---------	---	---	2.0-5.0	Perched	Dec-Mar	>60	---	High-----	Moderate.
Rd: Rader-------------	D	None---------	---	---	2.0-5.0	Perched	Dec-Mar	>60	---	High-----	Moderate.
Derly-------------	D	None---------	---	---	0-1.5	Perched	Oct-May	>60	---	High-----	High.
[illegible]---------------- Robco	C	None---------	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	High-----	High.
[illegible]: Robco-------------	C	None---------	---	---	1.5-3.5	Perched	Jan-Apr	>60	---	High-----	High.
Gullied land.											
[illegible], SaD----------- Silawa	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
[illegible]---------------- Silstid	A	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard-ness	Uncoated steel	Concrete
					Ft			In			
TaB---------------- Tabor	D	None---------	---	---	>6.0	---	---	>60	---	High------	High.
TcE:											
Tenaha------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Cuthbert----------	C	None---------	---	---	>6.0	---	---	>60	---	High------	High.
ToC---------------- Tonkawa	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Moderate.
TrB---------------- Trawick	B	None---------	---	---	>6.0	---	---	40-60	Soft	High------	High.
TxE:											
Trawick-----------	B	None---------	---	---	>6.0	---	---	40-60	Soft	High------	High.
Bub---------------	C	None---------	---	---	>6.0	---	---	12-20	Soft	High------	Moderate.
WcA---------------- Wilson	D	None---------	---	---	0.5-1.5	Perched	Nov-Mar	>60	---	High------	High.
WoC---------------- Wolfpen	A	None---------	---	---	4.0-6.0	Apparent	Dec-May	>60	---	Moderate	High.
WtC, WtD----------- Woodtell	D	None---------	---	---	>6.0	---	---	>60	---	High------	High.

TABLE 17.--PHYSICAL ANALYSES OF SELECTED SOILS

[Dashes indicate data were not available]

Soil name and sample number	Depth	Horizon	Particle-size distribution								COLE	Bulk density 1/3 bar	Water content 1/3 bar
			Sand										
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2-0.05 mm)	Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct(wt)
Crockett: 1/ 2/ S82TX289-031	0-6	Ap	1.1	0.8	1.8	20.1	25.4	49.2	32.4	18.4	0.05	1.59	20.6
	6-19	Bt1	1.2	0.9	1.2	10.4	13.3	27.0	26.8	46.2	0.11	1.35	33.3
	19-30	Bt2	1.1	0.6	1.4	12.3	15.1	30.5	30.6	38.9	0.11	1.43	30.2
	30-49	Bt3	1.1	0.4	1.4	12.7	16.0	31.6	35.6	32.8	0.09	1.66	22.8
	49-70	Btk	0.6	0.4	1.3	11.9	14.6	28.8	36.7	34.5	0.09	1.56	27.4
	70-80	BC	0.2	0.3	1.2	12.4	14.9	29.0	35.0	36.0	0.10	1.52	26.3
Dimebox: 1/ 3/ S82TX289-030	0-4	A1	0.2	0.2	0.3	2.6	4.9	8.2	45.5	46.3	0.20	1.02	50.3
	4-33	A2	0.3	0.2	0.3	2.5	5.8	9.1	35.1	55.8	0.18	1.17	39.0
	33-49	Bw	0.9	0.6	0.5	3.8	8.2	14.0	33.8	52.2	0.14	1.32	33.7
	49-71	Bk	2.5	1.7	0.9	2.5	4.9	12.5	31.7	55.8	0.12	1.39	30.9
	71-83	BC	0.1	0.0	0.0	0.2	0.8	1.1	26.1	72.8	0.18	1.17	42.8
	83-91	C	1.9	1.0	0.3	1.0	1.6	5.8	26.2	68.0	---	---	---
Gasil: 4/ 5/ S82TX289-028	0-9	Ap	0.2	0.2	1.9	38.2	32.9	73.4	24.5	2.1	---	1.50	---
	9-15	E	0.2	0.2	2.0	35.7	31.1	69.2	24.7	6.1	0.00	1.53	7.2
	15-25	Bt1	0.9	0.3	1.7	29.1	24.0	56.0	23.4	20.6	0.02	1.59	17.4
	25-42	Bt2	0.8	0.3	1.5	23.8	22.4	48.8	20.8	30.4	0.01	1.66	16.7
	42-56	Bt3	2.6	0.8	1.6	24.6	23.5	53.1	22.1	24.8	0.01	1.66	16.9
	56-67	B/E	0.5	0.6	1.5	22.3	25.1	50.0	27.3	22.7	0.02	1.70	15.9
	67-82	2Bt1	0.3	0.2	1.0	19.8	27.3	48.6	21.5	29.9	0.04	1.75	17.3
	82-110	2Bt2	0.4	0.5	0.9	6.8	16.5	25.1	29.5	45.4	0.08	1.62	23.6
Marquez: 4/ 6/ S82TX289-025	0-7	A	1.8	1.5	1.2	13.3	49.4	67.2	29.9	2.9	---	1.52	8.1
	7-13	E	4.3	1.7	1.2	12.9	46.2	66.3	30.0	3.7	0.00	1.58	11.3
	13-24	Bt1	2.3	0.6	0.6	5.8	23.6	32.9	21.2	45.9	0.04	1.55	21.3
	24-42	Bt2	0.6	0.5	0.3	1.9	13.3	16.6	22.8	60.6	---	1.50	---
	42-50	BC	1.6	0.9	0.6	1.7	21.5	26.3	31.1	42.6	0.04	1.47	24.7
	50-65	C	0.7	0.5	0.3	0.7	24.2	26.4	40.3	33.3	0.03	1.59	20.7
	65-80	C	0.4	0.3	0.3	2.4	69.3	72.7	11.3	16.0	0.01	1.62	10.9

See footnotes at end of table.

TABLE 19.--PHYSICAL ANALYSES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Particle-size distribution								COLE	Bulk density 1/3 bar	Water content 1/3 bar
			Sand						Silt (0.05-0.002 mm)	Clay (<0.002 mm)			
			Very coarse (2-1 mm)	Coarse (1-0.5 mm)	Medium (0.5-0.25 mm)	Fine (0.25-0.1 mm)	Very fine (0.1-0.05 mm)	Total (2-0.05 mm)					
	In		Pct	Pct	Pct	Pct	Pct	Pct	Pct	Pct	Cm/cm	g/cc	Pct(wt)
Wilson: 1/ 7/ S82TX289-032	0-6	Ap	0.4	0.3	1.0	9.7	17.1	28.5	45.4	26.1	0.07	1.39	26.2
	6-17	BA	0.4	0.2	1.3	12.2	17.7	31.8	38.8	29.4	0.06	1.50	24.7
	17-42	Btg	0.3	0.2	1.1	11.3	15.8	28.7	34.4	36.9	0.09	1.52	26.0
	42-60	Bt	0.4	0.2	0.7	7.7	14.6	23.6	38.5	37.9	0.09	1.55	25.3
	60-74	Btk	0.3	0.4	1.2	9.8	15.0	26.7	34.1	39.2	0.09	1.56	24.9
	74-80	Bw	0.1	0.1	0.6	13.3	20.6	34.7	31.4	33.9	---	---	---

1/ Analysis by Soil Characterization Laboratory, Texas A&M University, College Station, Texas.

2/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southeast on a private road, 125 feet east in field. This is a taxadjunct because the Ap horizon is slightly more acid than allowed for the series.

3/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

4/ Analysis by National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.

5/ Location of pedon sample: From U.S. Highway 79 in Marquez, 0.5 mile northwest on Farm Road 1146, 0.25 mile northwest on a county road, 0.44 mile southwest on a private road, 150 feet northwest in pasture. This is a taxadjunct because data fail 24meq/100gm of clay as required for an Ultic classification.

6/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology." The C horizon was subdivided for sampling.

7/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southeast on a private road, 100 feet east in field. This is a taxadjunct because the upper part of the Bt horizon is more acid than allowed for the series.

TABLE 20.--CHEMICAL ANALYSES OF SELECTED SOILS

[Dashes indicate data were not available. T indicates a trace amount]

Soil name and sample number	Depth	Horizon	Extractable bases (milliequivalents per 100 grams of soil)				Cation -exchange capacity	Base saturation	Reaction 1:1 soil:water	Organic carbon	Aluminum saturation	Ex-changeable sodium
			Ca	Mg	K	Na						
	In						Meq/100gm	Pct	pH	Pct	Pct	Pct
Crockett: 1/ 2/ S82TX289-031	0-6	Ap	7.5	2.9	0.1	0.1	13.0	81	5.4	0.72	---	1
	6-19	Bt1	14.0	6.9	0.1	0.6	26.6	82	5.5	0.61	---	2
	19-30	Bt2	13.7	6.5	0.1	0.8	23.4	91	5.6	0.38	---	4
	30-49	Bt3	14.8	6.5	0.1	1.0	22.1	---	6.5	0.14	---	5
	49-70	Btk	18.1	7.1	0.1	1.6	24.1	---	7.2	0.09	---	7
	70-80	BC	17.3	7.1	0.1	1.6	24.7	---	7.6	0.08	---	6
Dimebox: 1/ 3/ S82TX289-030	0-4	A1	34.0	7.2	0.7	0.2	48.6	86	4.8	5.16	---	0
	4-33	A2	42.2	5.9	0.2	0.2	49.3	98	5.9	2.14	---	0
	33-49	Bw	37.5	5.5	0.2	0.2	41.8	---	6.6	0.80	---	1
	49-71	Bk	70.1	7.0	0.2	0.3	40.3	---	8.2	0.24	---	1
	71-83	BC	43.3	7.5	0.4	0.2	43.7	---	7.6	0.16	---	1
	83-91	C	75.3	8.2	0.5	0.3	47.0	---	7.8	0.07	---	1
Gasil: 4/ 5/ S82TX289-028	0-9	Ap	1.2	0.3	T	---	1.8	48	4.9	0.40	6	1
	9-15	E	1.9	0.3	T	---	2.2	76	5.8	0.20	---	---
	15-25	Bt1	3.9	2.5	0.1	T	7.8	61	5.6	0.32	---	---
	25-42	Bt2	2.2	3.4	0.1	0.1	9.6	45	5.0	0.28	19	---
	42-56	Bt3	1.4	2.2	0.1	0.1	7.4	42	5.2	0.16	27	---
	56-67	B/E	1.8	2.5	0.1	0.3	7.6	51	5.3	0.10	13	---
	67-82	2Bt1	4.2	4.4	0.2	0.9	11.6	66	5.6	0.10	---	---
	82-110	2Bt2	7.7	8.1	0.3	2.4	21.0	78	4.9	0.16	1	---
Marquez: 4/ 6/ S82TX289-025	0-7	A	1.1	0.4	0.1	---	2.6	19	5.0	0.54	11	---
	7-13	E	0.7	0.4	0.1	---	1.8	8	5.2	0.27	8	---
	13-24	Bt1	2.9	5.1	0.4	0.1	13.5	36	5.2	0.44	11	---
	24-42	Bt2	3.0	7.6	0.3	0.2	18.6	44	5.1	0.30	21	---
	42-50	BC	1.3	5.9	0.3	0.2	16.9	36	5.0	0.21	43	---
	50-65	C	1.0	5.2	0.2	0.2	16.1	33	4.7	0.19	51	---
	65-80	C	T	1.3	0.1	0.1	7.3	16	4.5	0.16	75	---

See footnotes at end of table.

TABLE 20.--CHEMICAL ANALYSES OF SELECTED SOILS--Continued

Soil name and sample number	Depth	Horizon	Extractable bases (milliequivalents per 100 grams of soil)				Cation -exchange capacity	Base satura-tion	Reaction 1:1 soil:water	Organic carbon	Alumi-num satur-ation	Ex-change-able sodium
			Ca	Mg	K	Na						
	In						Meq/100gm	Pct	pH	Pct	Pct	Pct
Wilson: 1/ 7/ S82TX289-032	0-6	Ap	15.3	4.7	0.1	0.1	22.2	91	6.3	1.03	---	0
	6-17	BA	13.1	5.1	0.0	0.3	22.5	82	5.1	0.61	---	1
	17-42	Btg	15.6	6.2	0.0	0.6	25.6	88	5.4	0.41	---	2
	42-60	Bt	20.0	7.4	0.1	1.2	26.6	---	7.1	0.18	---	4
	60-74	Btk	24.8	7.1	0.1	1.3	25.1	---	7.7	0.20	---	5
	74-80	Bw	17.4	5.8	0.1	1.1	22.6	---	7.6	0.07	---	5

1/ Analysis by Soil Characterization Laboratory, Texas A&M University, College Station, Texas.

2/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.2 miles southeast on a private road, 125 feet east in field. This is a taxadjunct because the Ap and Bt horizons are slightly more acid than allowed for the series.

3/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

4/ Analysis by National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.

5/ Location of pedon sample: From U.S. Highway 79 in Marquez, 0.5 mile northwest on Farm Road 1146, 0.25 mile northwest on a county road, 0.44 mile southwest on a private road, 150 feet northwest in pasture. This is a taxadjunct because data fail 24meq/100gm of clay as required for an Ultic classification and the A horizon is slightly more acid than allowed for the series.

6/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology." The C horizon was subdivided for sampling.

7/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southeast on a private road, 100 feet east in field. This is a taxadjunct because the upper part of the Bt horizon is more acid than allowed for the series.

TABLE 21.--CLAY MINERALOGY OF SELECTED SOILS

[Dashes indicate data were not available. A=more than 50 percent, B=10 to 50 percent, 1=trace, 2=small, 3=moderate, and 4=abundant]

Soil name and sample number	Depth	Horizon	Clay minerals (x-ray)				
			Goethite	Kaolinite	Mica	Quartz	Smectite
	In		Pct	Pct	Pct	Pct	Pct
Crockett: 1/ 2/ S82TX289-031	0-6	Ap	---	B	---	B	A
	19-30	Btk	---	B	---	B	A
	70-80	BC	---	B	---	B	A
Dimebox: 1/ 3/ S82TX289-030	0-4	A1	---	B	---	B	A
	33-49	Bw	---	B	---	B	A
	83-91	C	---	B	---	B	A
Gasil: 4/ 5/ S82TX289-028	15-25	Bt1	1	3	2	--- 8/	2
	67-82	2Bt1	2	4	2	--- 9/	4
Marquez: 3/ 4/ 6/ S82TX289-025	13-24	Bt1	1	4	2	---	2
	50-65	C	0	4	2	---	4
Wilson: 1/ 7/ S82TX289-032	0-6	Ap	---	B	---	B	A
	17-42	Btg	---	B	---	B	A
	74-80	Bw	---	B	---	B	A

1/ Analysis by Soil Characterization Laboratory, Texas A&M University, College Station, Texas.

2/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southeast on a private road, 125 feet east in field. This is a taxadjunct because the Ap horizon is slightly more acid than allowed for the series.

3/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

4/ Analysis by National Soil Survey Laboratory, Soil Conservation Service, Lincoln, Nebraska.

5/ Location of pedon sample: From U.S. Highway 79 in Marquez, 0.5 mile northwest on Farm Road 1146, 0.25 mile northwest on a county road, 0.44 mile soutnwest on a private road, 150 feet northwest in pasture. This is a taxadjunct because data fail 24meq/100gm of clay as required for an Ultic classification.

6/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology." The C horizon was subdivided for sampling.

7/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southeast on a private road, 100 feet east in field. This is a taxadjunct because the upper part of the Bt horizon is more acid than allowed for the series.

8/ Mineralogy in percent of the very fine sand is 97 percent quartz, 2 percent potassium feldspar, 1 percent opaques, and a trace of plant opal, zircon, epidote, and hornblende.

9/ Mineralogy in percent of the very fine sand is 95 percent quartz, 2 percent opaques, 1 percent potassium feldspar, 1 percent zircon, and a trace of kaolinite, hornblende, and tourmaline.

TABLE 22.--ENGINEERING INDEX TEST DATA

[Dashes indicate data were not available. NP means nonplastic]

Soil name, map symbol, report number, horizon and depth in inches		Classification		Grain-size distribution						Liquid limit	Plasticity index	Specific gravity (particle density)	Shrinkage		
		AASHTO	Unified	Percentage passing sieve--									Limit	Linear	Ratio
				5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200						
										Pct		g/cc	Pct	Pct	Pct
Crockett: 1/ S82TX289-031	CsB														
Bt1	6-19	A-7-6 (19)	CL	100	100	100	99	97	74	45	27	2.67	17.0	12.4	1.84
Btk	49-70	A-7-6 (23)	CL	100	100	100	99	98	76	48	31	2.68	12.0	16.0	1.97
Dimebox: 2/ S82TX289-030	DmA														
A2	4-33	A-7-5 (47)	CH	100	100	100	99	99	92	74	44	2.72	19.0	20.5	1.80
Bk	49-71	A-7-6 (33)	CH	100	100	96	90	85	75	67	43	2.75	15.0	20.8	1.94
Gasil: 3/ S82TX289-028	GfB														
Ap	0-9	A-4 (0)	SM	100	100	99	98	98	44	21	2	2.62	19.0	1.2	1.71
Bt2	25-42	A-6 (6)	CL	100	100	95	90	90	55	35	16	2.68	16.0	9.3	1.86
Margie: 2/ S82TX289-029	MgB														
A	0-10	A-2-4 (0)	SM-SC	100	99	98	95	92	34	24	6	2.70	20.0	2.4	1.73
Bt1	14-27	A-7-6 (9)	CL	100	100	99	97	94	55	44	21	2.73	17.0	12.9	1.86
BC	63-70	A-2-4 (0)	SC	100	100	100	100	100	24	30	9	2.65	23.0	4.0	1.64
C	70-80	A-2-6 (2)	SC	100	100	99	98	96	33	36	20	2.65	18.0	8.6	1.76
Marquez: 4/ S82TX289-025	MkB														
A	0-7	A-4 (1)	CL-ML	100	100	99	96	92	65	24	4	2.63	20.0	2.2	1.68
Bt2	24-42	A-7-6 (36)	CH	100	100	99	96	94	88	62	37	2.73	19.0	17.3	1.79
C	50-65	A-7-6 (29)	CL	100	100	99	96	96	93	50	29	2.67	18.0	14.1	1.81

See footnotes at end of table.

TABLE [illegible].--ENGINEERING INDEX TEST DATA--Continued

Soil name, map symbol, report number, horizon and depth in inches	Classification		Grain-size distribution						Liquid limit	Plasticity index	Specific gravity (particle density)	Shrinkage		
	AASHTO	Unified	Percentage passing sieve--									Limit	Linear	Ratio
			5/8 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200						
									Pct		g/cc	Pct	Pct	Pct
Wilson: 5/ CsB S82TX289-032														
BA 6-17	A-6 (15)	CL	100	100	100	100	99	76	39	22	2.69	12.0	13.2	2.00
Bt 42-60	A-7-6 (28)	CH	100	100	100	100	99	82	51	34	2.68	13.0	17.5	2.02

1/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 east on a county road, 1.3 miles southeast on a private road, 125 feet east in field. This is a taxadjunct because the Ap horizon is slightly more acid than allowed for the series.

2/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

3/ Location of pedon sample: From U.S. Highway 79 in Marquez, 0.5 mile northwest on Farm Road 1146, 0.25 mile northwest on a county road, 0.44 mile southwest on a private road, 150 feet northwest in pasture. This is a
taxadjunct because data fail 24meq/100gm of clay as required for an Ultic classification.

4/ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology." The lower part of the C horizon was not sampled.

5/ Location of pedon sample: From Farm Road 977 in Leona, 1.65 miles southeast on Texas Highway 75, 0.4 mile east on a county road, 1.3 miles southwest on a private road, 100 feet east in field. This is a taxadjunct because the upper part of the Bt horizon is more acid than allowed for the series.

TABLE 23.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Arenosa	Thermic, coated Typic Quartzipsamments
Ashford	Very fine, montmorillonitic, thermic Vertic Ochraqualfs
*Attoyac	Fine-loamy, siliceous, thermic Typic Paleudalfs
Axtell	Fine, montmorillonitic, thermic Udertic Paleustalfs
Benchley	Fine, montmorillonitic, thermic Vertic Argiustolls
*Bienville	Sandy, siliceous, thermic Psammentic Paleudalfs
Bub	Clayey, mixed, thermic, shallow Typic Hapludalfs
Burleson	Fine, montmorillonitic, thermic Udic Pellusterts
Chazos	Fine, mixed, thermic Aquic Paleustalfs
Crockett	Fine, montmorillonitic, thermic Udertic Paleustalfs
Cuthbert	Clayey, mixed, thermic Typic Hapludults
Derly	Fine, montmorillonitic, thermic Typic Glossaqualfs
Dimebox	Fine, montmorillonitic, thermic Udic Pellusterts
Dutek	Loamy, siliceous, thermic Arenic Haplustalfs
Elrose	Fine-loamy, siliceous, thermic Typic Paleudalfs
Eufaula	Sandy, siliceous, thermic Psammentic Paleustalfs
Ferris	Fine, montmorillonitic, thermic Udorthentic Chromusterts
Flo	Sandy, siliceous, thermic Psammentic Paleudalfs
Flynn	Fine-loamy, siliceous, thermic Udic Paleustalfs
Garner	Fine, montmorillonitic, thermic Entic Pelluderts
Gasil	Fine-loamy, siliceous, thermic Ultic Paleustalfs
Gladewater	Fine, montmorillonitic, nonacid, thermic Vertic Haplaquepts
Gowker	Fine-loamy, mixed, thermic Cumulic Hapludolls
Hatliff	Coarse-loamy, siliceous, nonacid, thermic Aquic Udifluvents
Hearne	Clayey, mixed, thermic Typic Haplustults
*Jedd	Fine, mixed, thermic Ultic Paleustalfs
Kaufman	Very fine, montmorillonitic, thermic Typic Pelluderts
Kirvin	Clayey, mixed, thermic Typic Hapludults
Larue	Loamy, siliceous, thermic Arenic Paleudalfs
Lexton	Fine, mixed, thermic Udic Haplustalfs
Lufkin	Fine, montmorillonitic, thermic Vertic Albaqualfs
Lummus	Fine, mixed, thermic Aquic Glossudalfs
Mabank	Fine, montmorillonitic, thermic Vertic Albaqualfs
Margie	Fine, mixed, thermic Udic Paleustalfs
Marquez	Clayey, mixed, thermic Typic Haplustults
*Melhomes	Siliceous, thermic Humaqueptic Psammaquents
Nahatche	Fine-loamy, siliceous, nonacid, thermic Aeric Fluvaquents
*Nugent	Sandy, siliceous, thermic Typic Udifluvents
Oakwood	Fine-loamy, siliceous, thermic Plinthic Paleudalfs
Padina	Loamy, siliceous, thermic Grossarenic Paleustalfs
Pickton	Loamy, siliceous, thermic Grossarenic Paleudalfs
Rader	Fine-loamy, mixed, thermic Aquic Paleustalfs
Robco	Clayey, mixed, thermic Aquic Arenic Paleustalfs
Silawa	Fine-loamy, siliceous, thermic Ultic Haplustalfs
Silstid	Loamy, siliceous, thermic Arenic Paleustalfs
Tabor	Fine, montmorillonitic, thermic Udertic Paleustalfs
Tenaha	Loamy, siliceous, thermic Arenic Hapludults
Tonkawa	Thermic, coated Typic Quartzipsamments
Trawick	Fine, kaolinitic, thermic Mollic Hapludalfs
Wilson	Fine, montmorillonitic, thermic Vertic Ochraqualfs
Wolfpen	Loamy, siliceous, thermic Arenic Paleudalfs
Woodtell	Fine, montmorillonitic, thermic Vertic Hapludalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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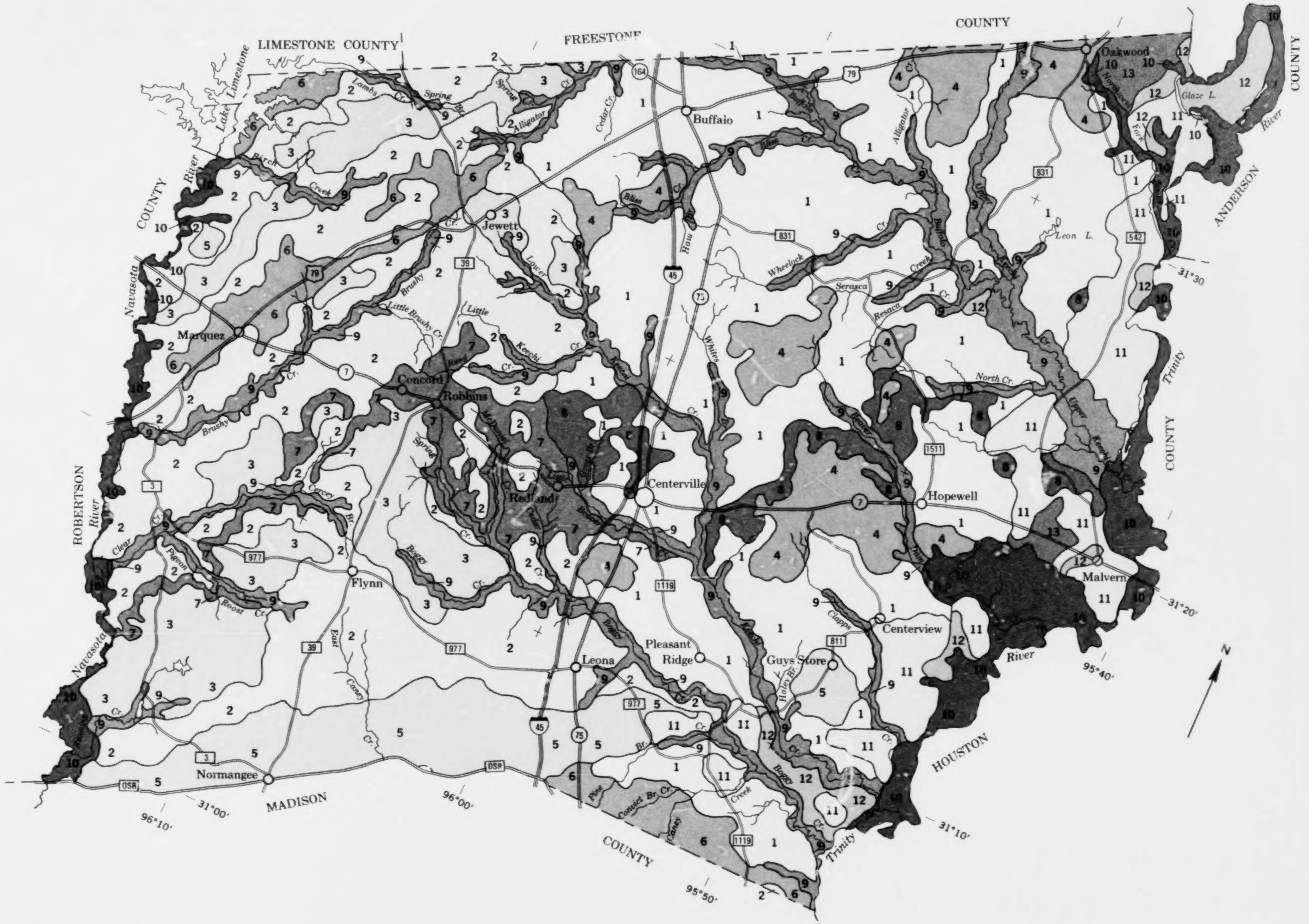
MAPS

TRANSPOSED TO

END OF VOLUME


LIMESTONE COUNTY
FREESTONE COUNTY
ANDERSON COUNTY
HOUSTON COUNTY
MADISON COUNTY
ROBERTSON COUNTY
Lake Limestone
Navasota River
Trinity River
Oakwood
Buffalo
Jewett
Marquez
Concord
Robbins
Redland
Centerville
Hopewell
Malvern
Centerview
Flynn
Leona
Pleasant Ridge
Guys Store
Normangee
Leon L.
Glaze L.
31°30′
31°20′
31°10′
31°00′
96°10′
96°00′
95°50′
95°40′
N

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

LEGEND

DOMINANTLY SANDY SOILS OF THE UPLANDS

1	Wolfpen-Pickton-Cuthbert: Gently sloping to moderately steep, deep, sandy and loamy soils that are well drained; in woodlands
2	Padina-Silstid-Hearne: Gently sloping to moderately steep, deep, sandy and loamy soils that are moderately well drained and well drained; on savannahs
3	Padina-Arenosa: Gently sloping to moderately steep, deep, sandy soils that are moderately well drained and somewhat excessively drained; on savannahs
4	Pickton-Tonkawa: Gently sloping to moderately steep, deep, sandy soils that are well drained and excessively drained; in woodlands

DOMINANTLY LOAMY SOILS OF THE UPLANDS

5	Crockett-Benchley-Wilson: Nearly level to strongly sloping, deep, loamy soils that are moderately well drained and somewhat poorly drained; on prairies
6	Axtell-Rader: Nearly level to strongly sloping, deep, loamy soils that are moderately well drained; on savannahs
7	Margie-Jedd-Lexton: Gently sloping to steep, deep and moderately deep, loamy soils that are well drained; on savannahs
8	Trawick-Bub-Cuthbert: Gently sloping to moderately steep, deep and shallow, loamy soils that are well drained, in woodlands

SOILS OF THE BOTTOM LANDS

9	Hatliff-Nahatche: Nearly level, deep, loamy soils that are moderately well drained and somewhat poorly drained
10	Gladewater-Kaufman: Nearly level, deep, clayey soils that are very poorly drained to somewhat poorly drained

SOILS OF THE TERRACES

11	Rader-Attoyac-Derly: Nearly level to strongly sloping, deep, loamy soils that are moderately well drained, well drained, and poorly drained
12	Bienville: Nearly level to gently sloping, deep, sandy soils that are somewhat excessively drained
13	Burleson-Garner: Nearly level to gently sloping, deep, clayey soils that are moderately well drained and poorly drained

Compiled 1987

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD

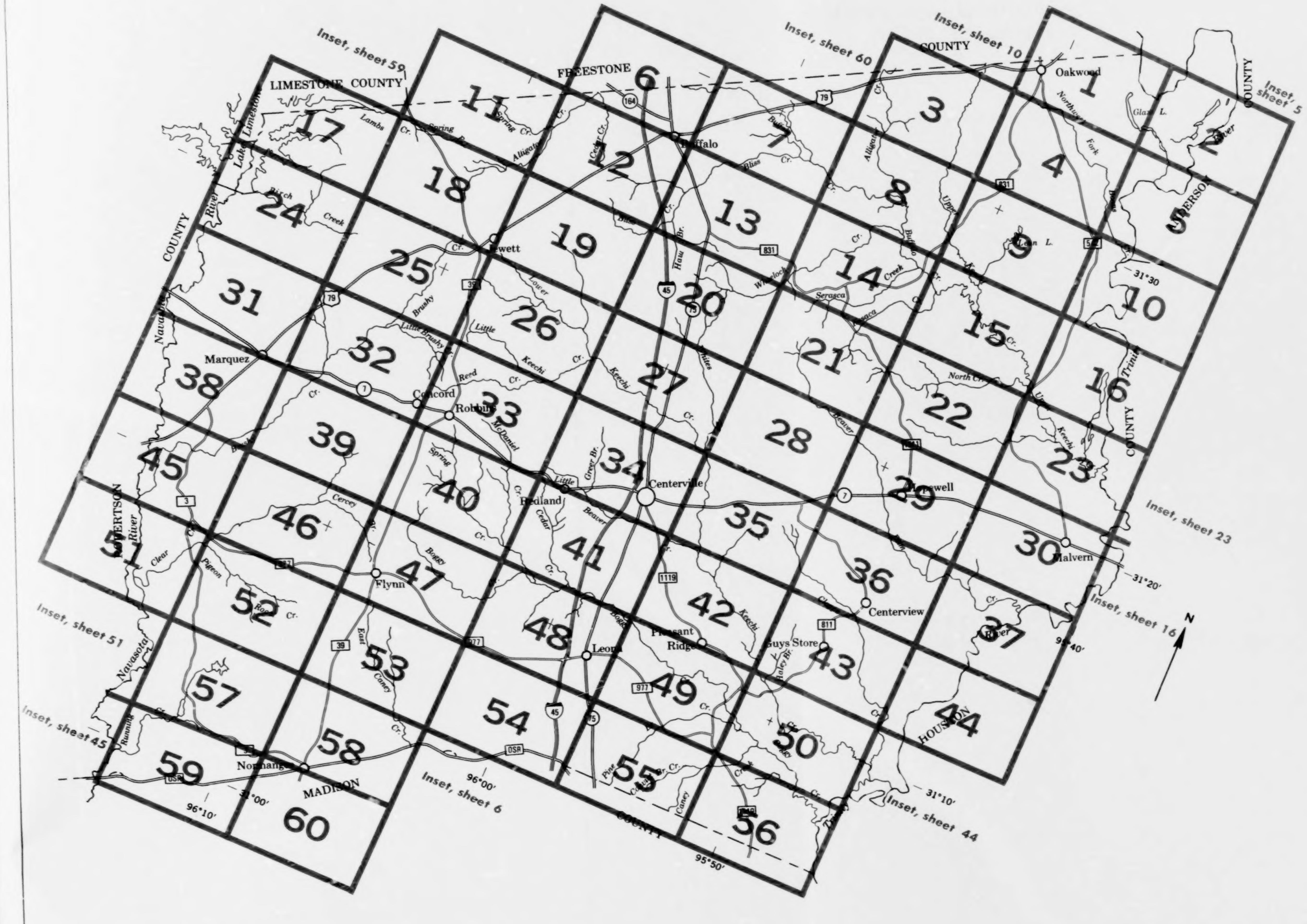
GENERAL SOIL MAP

LEON COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km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LIMESTONE COUNTY
FREESTONE
COUNTY
COUNTY
ANDERSON
COUNTY
HOUSTON
MADISON
COUNTY
ROBERTSON
Oakwood
Buffalo
Jewett
Marquez
Concord
Robbins
Centerville
Redland
Leona
Pleasant Ridge
Buys Store
Centerview
Jewell
Malvern
Flynn
Normangee
Navasota River
Trinity
Lambs Cr.
Spring Cr.
Alligator
Birch
Creek
Brushy
Little Brushy
Keechi Cr.
Little
Beaver
Boggy
Clear
Pigeon
East
Caney
Pine
North Cr.
Upper
Seco
Glass L.
31°30′
31°20′
31°10′
31°00′
95°40′
95°50′
96°00′
96°10′
N
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
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59
60

INDEX TO MAP SHEETS

LEON COUNTY, TEXAS

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

LEON COUNTY, TEXAS

TEXAS AGRICULTURAL EXPERIMENT STATION
TEXAS STATE SOIL AND WATER CONSERVATION BOARD

SOIL LEGEND

The map symbols recommended for publication are alphabetic letters. The first letter of the map symbol, always a capital, is the initial letter of the soil name. The second letter is a lower case letter. The third letter, if used, is a capital letter and denotes slope class. Symbols without a slope letter are for nearly level soils.

SYMBOL	NAME
ArC	Arenosa fine sand, 1 to 8 percent slopes
As	Ashford clay loam, 0 to 1 percent slopes
AtB	Attoyac fine sandy loam, 0 to 3 percent slopes
AtD	Attoyac fine sandy loam, 3 to 12 percent slopes
AxA	Axtell fine sandy loam, 0 to 1 percent slopes
AxB	Axtell fine sandy loam, 1 to 5 percent slopes
AxD	Axtell fine sandy loam, 5 to 12 percent slopes
BeB	Benchley clay loam, 1 to 5 percent slopes
BeD	Benchley clay loam, 5 to 8 percent slopes
BnB	Bienville loamy fine sand, 0 to 3 percent slopes
BuA	Burleson clay, 0 to 1 percent slopes
BuB	Burleson clay, 1 to 3 percent slopes
ChB	Chazos loamy fine sand, 1 to 5 percent slopes
CrB	Crockett fine sandy loam, 1 to 5 percent slopes
CrD	Crockett fine sandy loam, 5 to 10 percent slopes
CsB	Crockett-Wilson complex, 1 to 3 percent slopes
CuE	Cuthbert fine sandy loam, 5 to 20 percent slopes
CxE	Cuthbert fine sandy loam, 5 to 20 percent slopes, stony
De	Derly silt loam, 0 to 1 percent slopes
Df	Derly-Rader complex, gently undulating
DmA	Dimebox silty clay, 0 to 1 percent slopes
DuC	Dutek loamy fine sand, 1 to 8 percent slopes
ErC	Elrose fine sandy loam, 3 to 8 percent slopes
EuB	Eufaula loamy fine sand, 1 to 5 percent slopes
FeB	Ferris clay, 1 to 5 percent slopes
FeD	Ferris clay, 5 to 15 percent slopes
FoC	Flo loamy fine sand, 1 to 8 percent slopes
FyC	Flynn fine sandy loam, 3 to 6 percent slopes
GaA	Garner clay, 0 to 1 percent slopes
GfB	Gasil fine sandy loam, 1 to 5 percent slopes
GfD	Gasil fine sandy loam, 5 to 8 percent slopes
Gg	Gladewater clay, occasionally flooded
Gh	Gladewater clay, frequently flooded
Gp	Gladewater clay, depressional
Gw	Gowker clay loam, frequently flooded
Ha	Hatliff fine sandy loam, frequently flooded
HeB	Hearne fine sandy loam, 1 to 5 percent slopes
HeE	Hearne fine sandy loam, 5 to 20 percent slopes
HsE	Hearne fine sandy loam, 5 to 20 percent slopes, stony
HxE	Hearne fine sandy loam, graded, 5 to 20 percent slopes
JmE	Jedd-Margie complex, 5 to 25 percent slopes

SYMBOL	NAME
Ka	Kaufman clay, occasionally flooded
Kf	Kaufman clay, frequently flooded
Kg	Kaufman and Gladewater soils, frequently flooded
KrB	Kirvin fine sandy loam, 1 to 5 percent slopes
KsB	Kirvin gravelly fine sandy loam, 1 to 5 percent slopes
LaC	Larue loamy fine sand, 1 to 5 percent slopes
LeB	Lexton clay loam, 1 to 3 percent slopes
LfA	Lufkin fine sandy loam, 0 to 1 percent slopes
LmB	Lummus fine sandy loam, 1 to 5 percent slopes
MaA	Mabank fine sandy loam, 0 to 1 percent slopes
MgB	Margie fine sandy loam, 1 to 5 percent slopes
MgD	Margie fine sandy loam, 5 to 8 percent slopes
MhC	Margie-Gullied land complex, 1 to 8 percent slopes
MkB	Marquez very fine sandy loam, 1 to 5 percent slopes
MrB	Marquez gravelly fine sandy loam, 1 to 5 percent slopes
Ms	Melhomes loamy fine sand, 0 to 1 percent slopes
Na	Nahatche loam, frequently flooded
Nu	Nugent loamy fine sand, occasionally flooded
OkB	Oakwood fine sandy loam, 1 to 5 percent slopes
PaC	Padina loamy fine sand, 1 to 8 percent slopes
PaD	Padina loamy fine sand, 8 to 15 percent slopes
PkC	Pickton loamy fine sand, 1 to 8 percent slopes
PkD	Pickton loamy fine sand, 8 to 15 percent slopes
RaB	Rader fine sandy loam, 1 to 3 percent slopes
Rd	Rader-Derly complex, gently undulating
RoC	Robco loamy fine sand, 1 to 8 percent slopes
RxC	Robco-Gullied land complex, 1 to 8 percent slopes
SaB	Silawa fine sandy loam, 1 to 5 percent slopes
SaD	Silawa fine sandy loam, 5 to 8 percent slopes
SdB	Silstid loamy fine sand, 1 to 5 percent slopes
TaB	Tabor fine sandy loam, 1 to 5 percent slopes
TcE	Tenaha-Cuthbert complex, 8 to 20 percent slopes
ToC	Tonkawa fine sand, 1 to 8 percent slopes
TrB	Trawick fine sandy loam, 1 to 5 percent slopes
TxE	Trawick-Bub complex, 8 to 20 percent slopes
WcA	Wilson clay loam, 0 to 1 percent slopes
WoC	Wolfpen loamy fine sand, 1 to 8 percent slopes
WtC	Woodtell fine sandy loam, 1 to 5 percent slopes
WtD	Woodtell fine sandy loam, 5 to 12 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES	
National, state or province	——— – –
County or parish	——— –
Minor civil division	— — —
Reservation (national forest or park, state forest or park, and large airport)	—— · ——
Land grant	—— ·· ——
Limit of soil survey (label)	———
Field sheet matchline and neatline	———
AD HOC BOUNDARY (label)	Swift Airport
Small airport, airfield, park, oilfield, cemetery, or flood pool	FLOOD POOL LINE
STATE COORDINATE TICK	——┴——
LAND DIVISION CORNER (sections and land grants)	└ ┴ ┼ ┬┴
ROADS	
Divided (median shown if scale permits)	═══
Other roads	———
Trail	– – – – –
ROAD EMBLEM & DESIGNATIONS	
Interstate	21
Federal	173
State	28
County, farm or ranch	1283
RAILROAD	—┼—┼—┼—
POWER TRANSMISSION LINE (normally not shown)	- - - • - - - • - - -
PIPE LINE (normally not shown)	├─┤├─┤├─┤├─┤
FENCE (normally not shown)	—×———×—
LEVEES	
Without road	ıııııııııııııı
With road	
With railroad	
DAMS	
Large (to scale)	
Medium or Small	water w
PITS	
Gravel pit	⚒
Mine or quarry	⚒

MISCELLANEOUS CULTURAL FEATURES	
Farmstead, house (omit in urban areas)	■
Church	
School	
Indian mound (label)	⌒ Indian Mound
Located object (label)	○ Tower
Tank (label)	● Gas
Wells, oil or gas	
Windmill	
Kitchen midden	⊓

WATER FEATURES

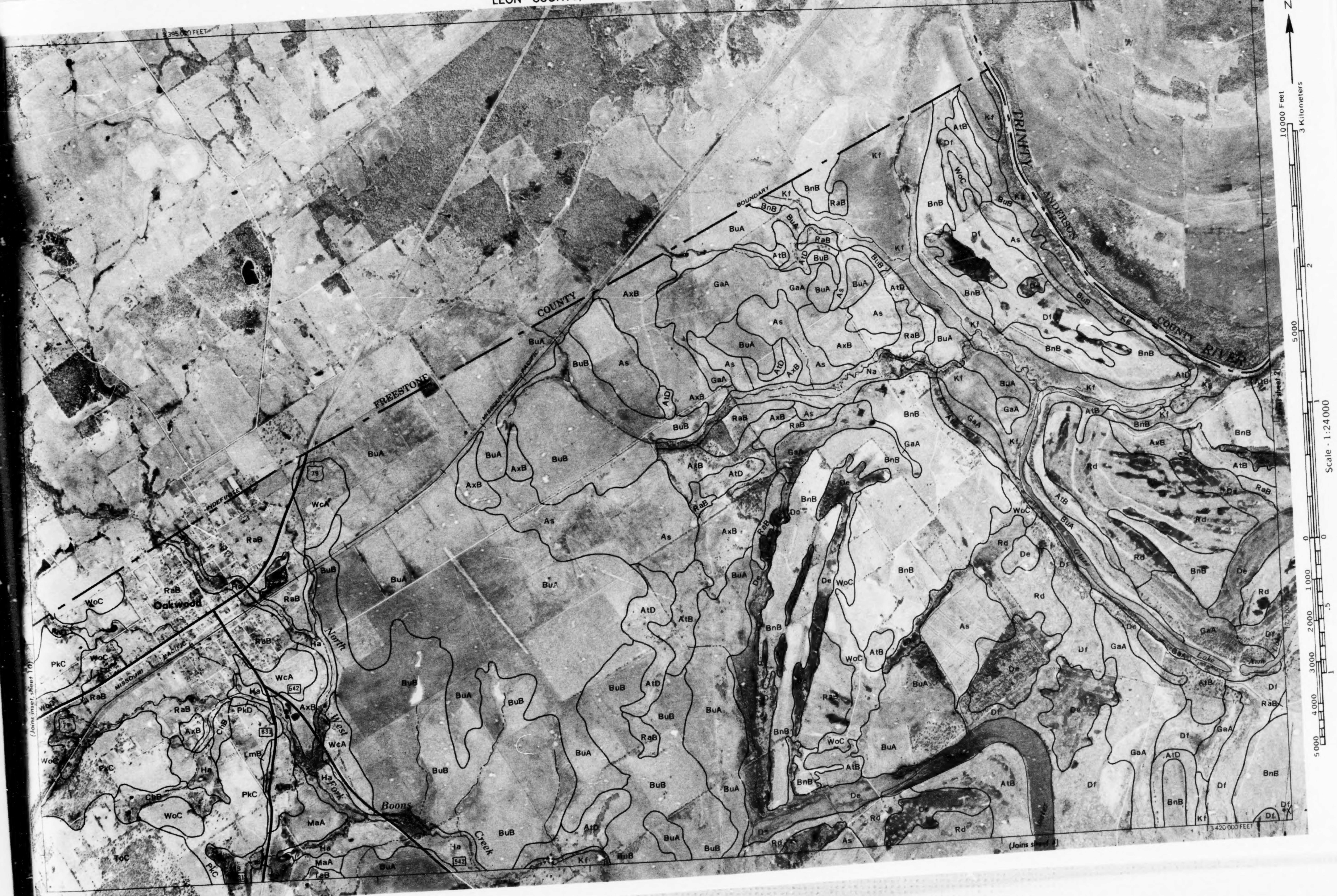
DRAINAGE	
Perennial, double line	≈
Perennial, single line	
Intermittent	
Drainage end	
Canals or ditches	
Double-line (label)	CANAL
Drainage and/or irrigation	—→— · —→—
LAKES, PONDS AND RESERVOIRS	
Perennial	water w
Intermittent	int i
MISCELLANEOUS WATER FEATURES	
Marsh or swamp	
Spring	o~
Well, artesian	◆
Well, irrigation	-o-
Wet spot	ψ

SPECIAL SYMBOLS FOR SOIL SURVEY

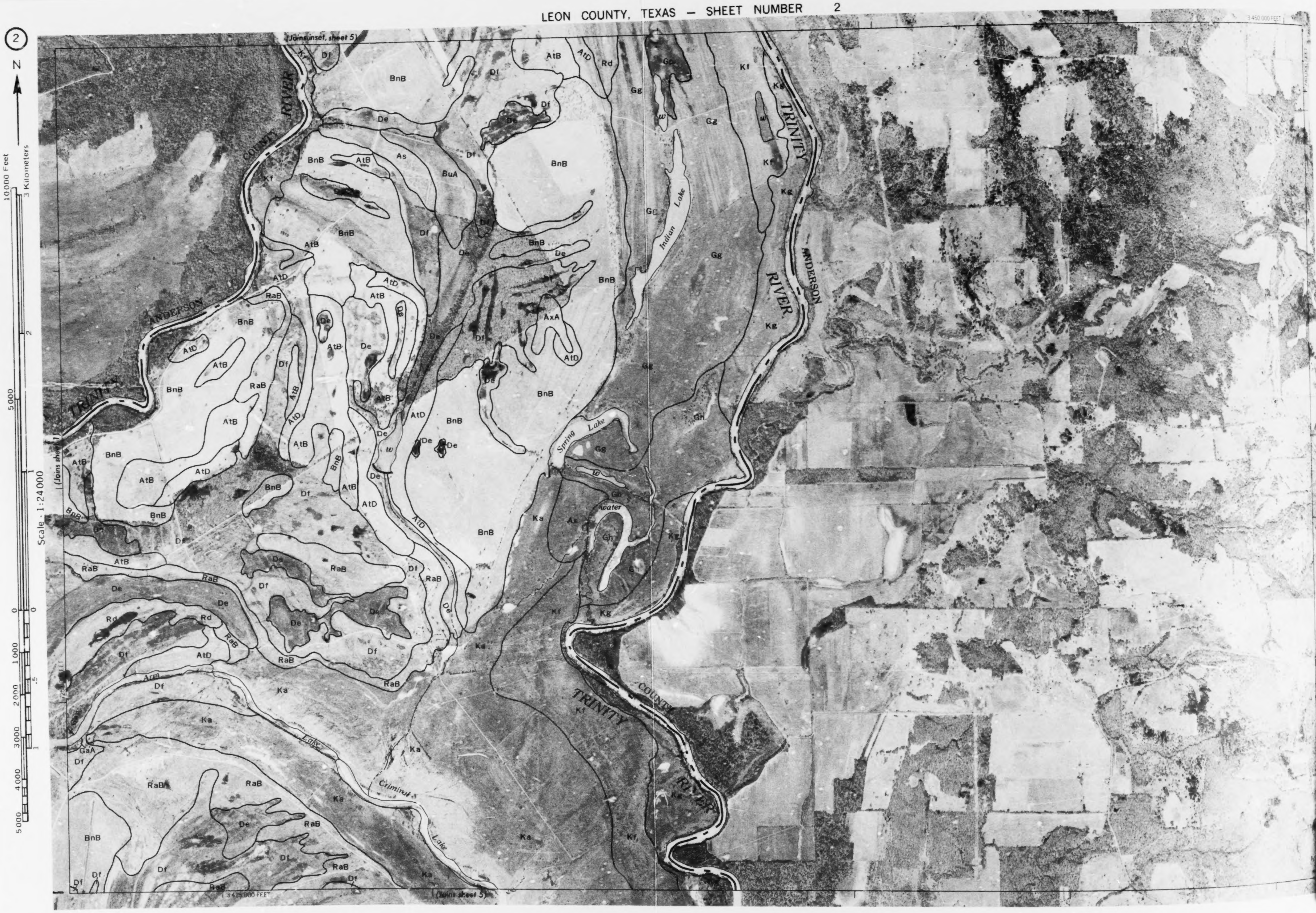
SOIL DELINEATIONS AND SYMBOLS	AxA AxD
ESCARPMENTS	
Bedrock (points down slope)	vvvvvvvvvvvvvvvvvv
Other than bedrock (points down slope)	ııııııııııııııııııııı
SHORT STEEP SLOPE	. . . .
GULLY	∿∿∿∿∿∿∿∿∿∿
DEPRESSION OR SINK	◊
SOIL SAMPLE (normally not shown)	Ⓢ
MISCELLANEOUS	
Blowout	◡
Clay spot	※
Gravelly spot	∴
Gumbo, slick or scabby spot (sodic)	ø
Dumps and other similar non soil areas	≡
Prominent hill or peak	☼
Rock outcrop (includes sandstone and shale)	▾
Saline spot	+
Sandy spot	∵
Severely eroded spot	÷
Slide or slip (tips point upslope)	)))
Stony spot, very stony spot	0 ∞

LEON COUNTY, TEXAS — SHEET NUMBER 1

①


3 395 000 FEET
FREESTONE COUNTY BOUNDARY
TRINITY RIVER
ANDERSON COUNTY
MISSOURI PACIFIC
Oakwood
North Fork
West Fork
Boons Creek
79
542
831
(Joins inset, sheet 10)
(Joins sheet 5)
(Joins sheet 2)
3 420 000 FEET
Lake
N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000 4000 3000 2000 1000 0 5000
1 .5 0 1 2
AtB
AtD
As
AxB
BnB
BuA
BuB
ChB
De
Df
Ds
GaA
Ha
Kf
LmB
MaA
Na
PkC
PkD
RaB
Rd
TeB
ToC
WcA
WoC

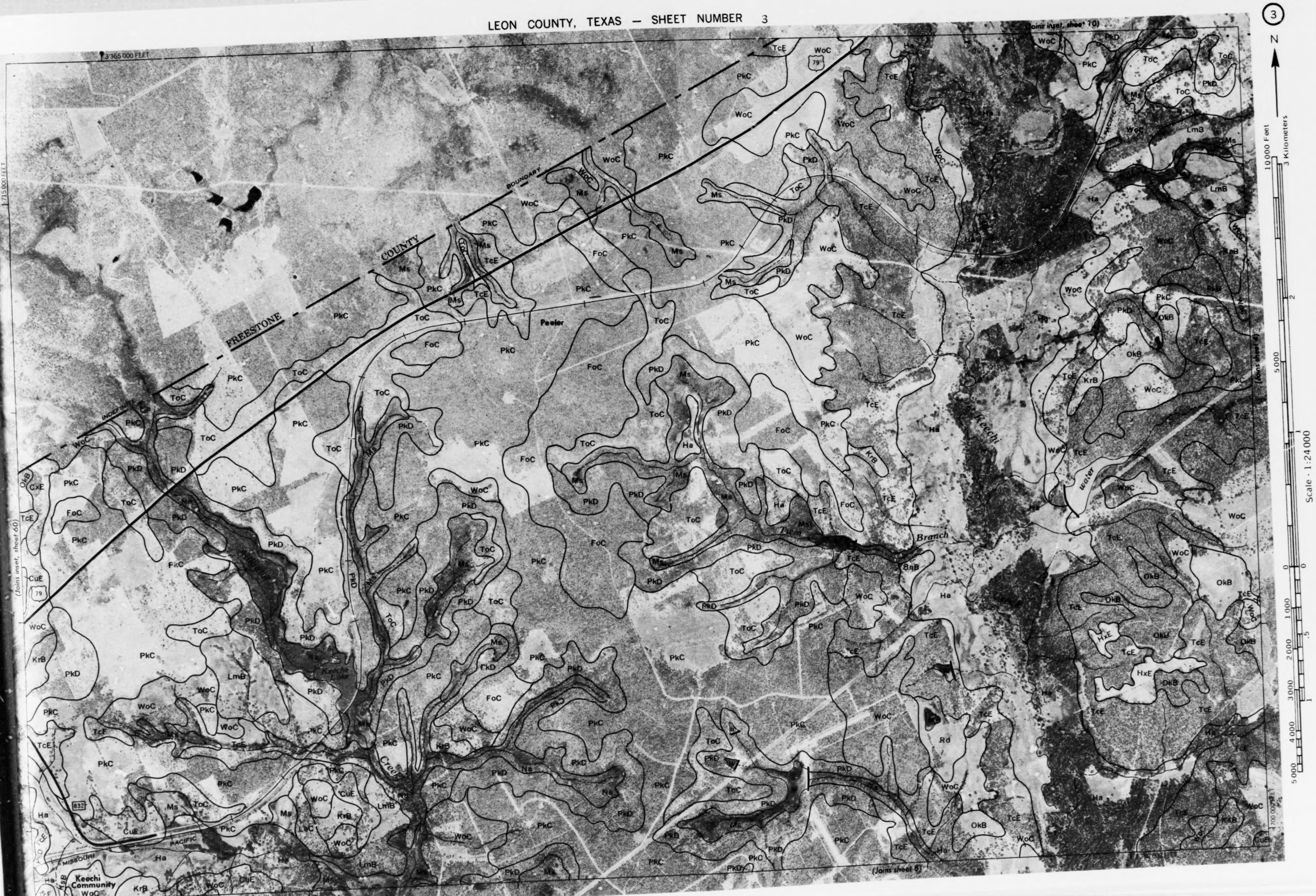
LEON COUNTY, TEXAS — SHEET NUMBER 2



②
N
Scale - 1:24 000
10 000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
(Joins inset, sheet 5)
(Joins sheet 5)
(Joins sheet 1)
3 425 000 FEET
3 450 000 FEET
TRINITY
RIVER
ANDERSON
COUNTY
Indian Lake
Spring Lake
Criminal Lake
water
BnB
AtB
AtD
As
BuA
Df
De
RaB
Rd
AxA
Ka
Kf
Kg
Gg
Gh
GaA
w

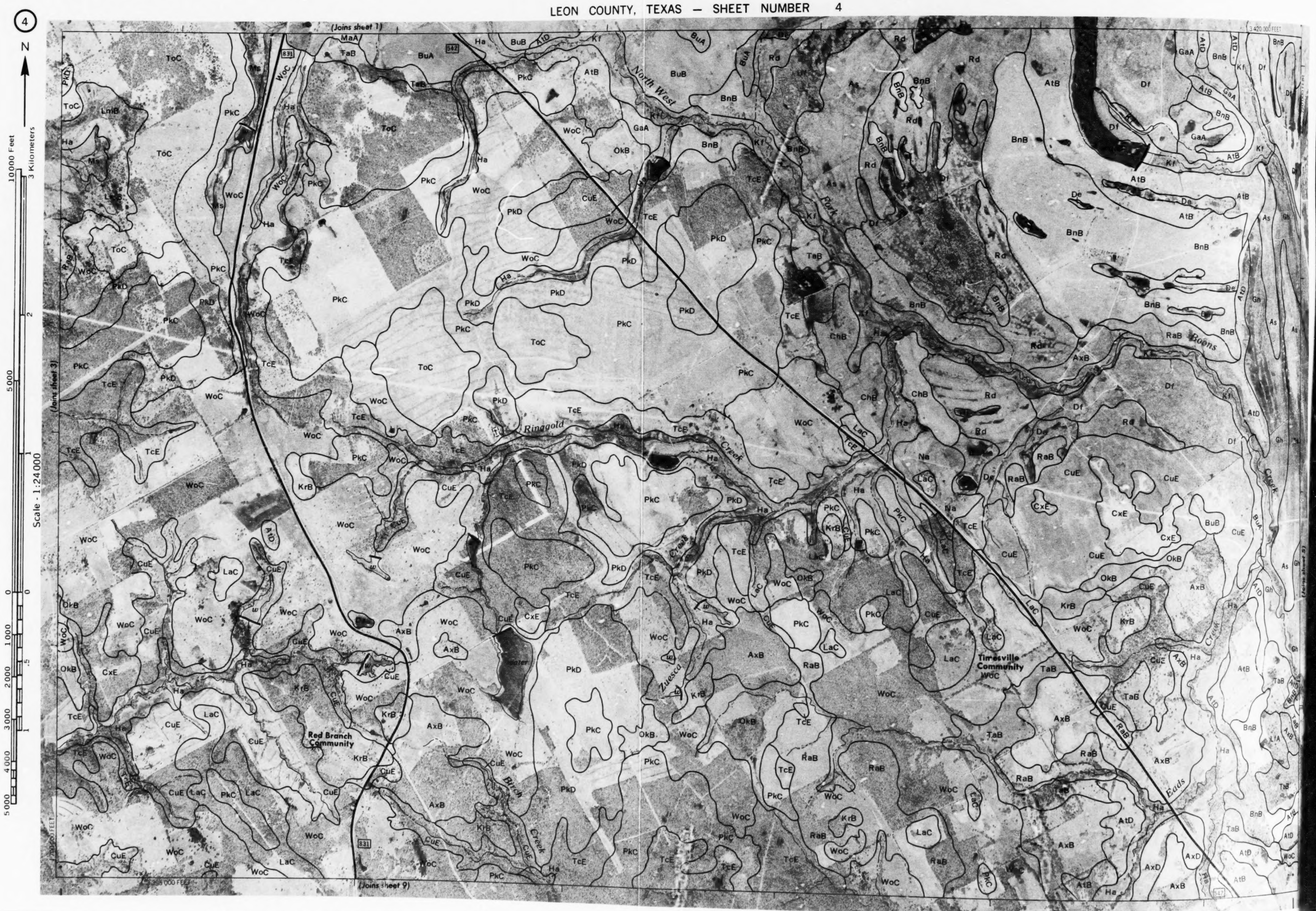
③

LEON COUNTY, TEXAS — SHEET NUMBER 3

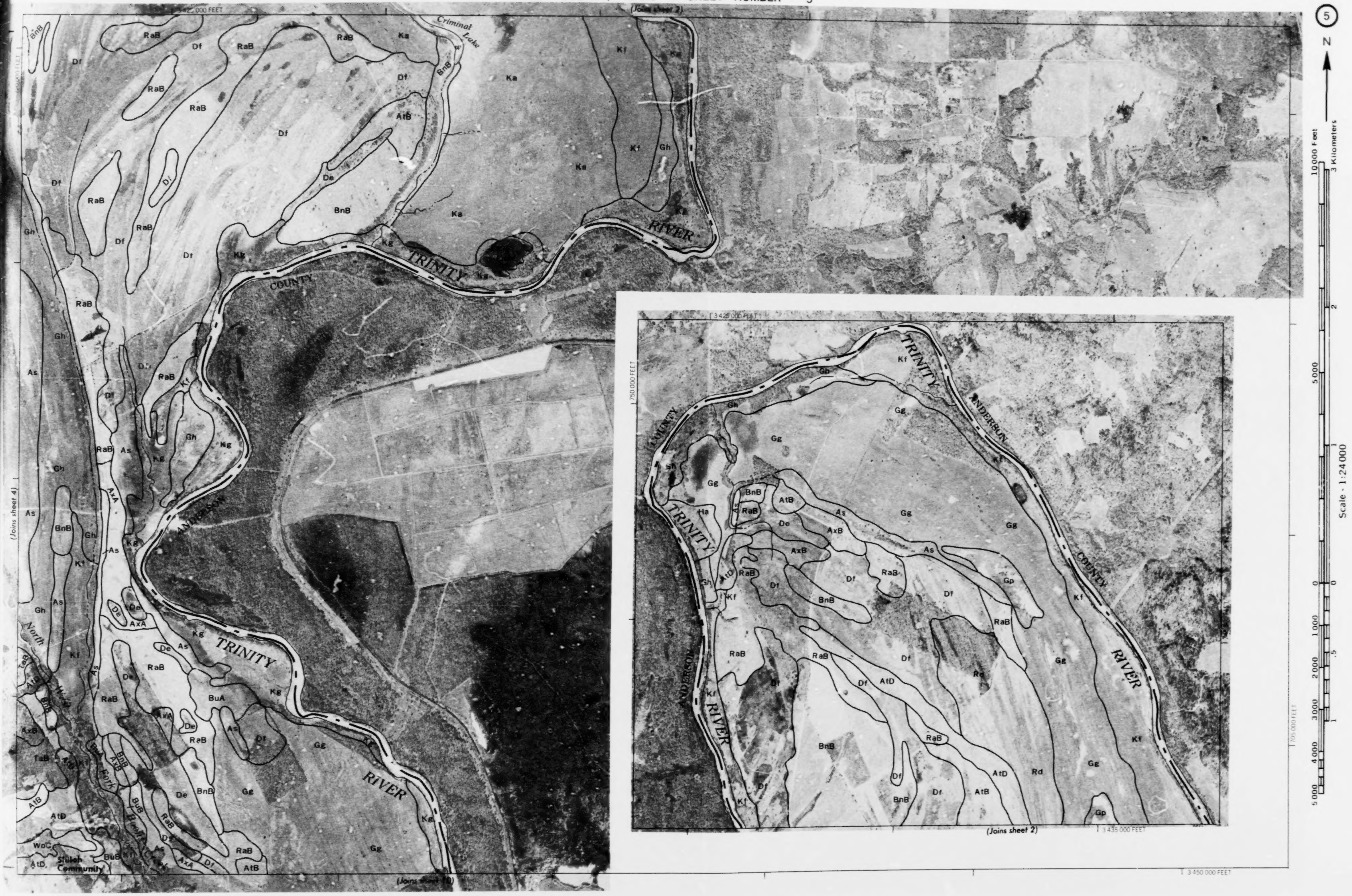

(Joins inset, sheet 10)
3 365 000 FEET
1 715 000 FEET
FREESTONE
COUNTY
BOUNDARY
INDEFINITE
Peeler
Keechi
Branch
Creek
water
Keechi Community
MISSOURI
PACIFIC
79
832
(Joins inset, sheet 60)
(Joins sheet 6)
N
10 000 Feet
3 Kilometers
Scale 1:24 000
5 000
0
1 000
2 000
3 000
4 000
5 000
.5
1
2
3

④

LEON COUNTY, TEXAS — SHEET NUMBER 4

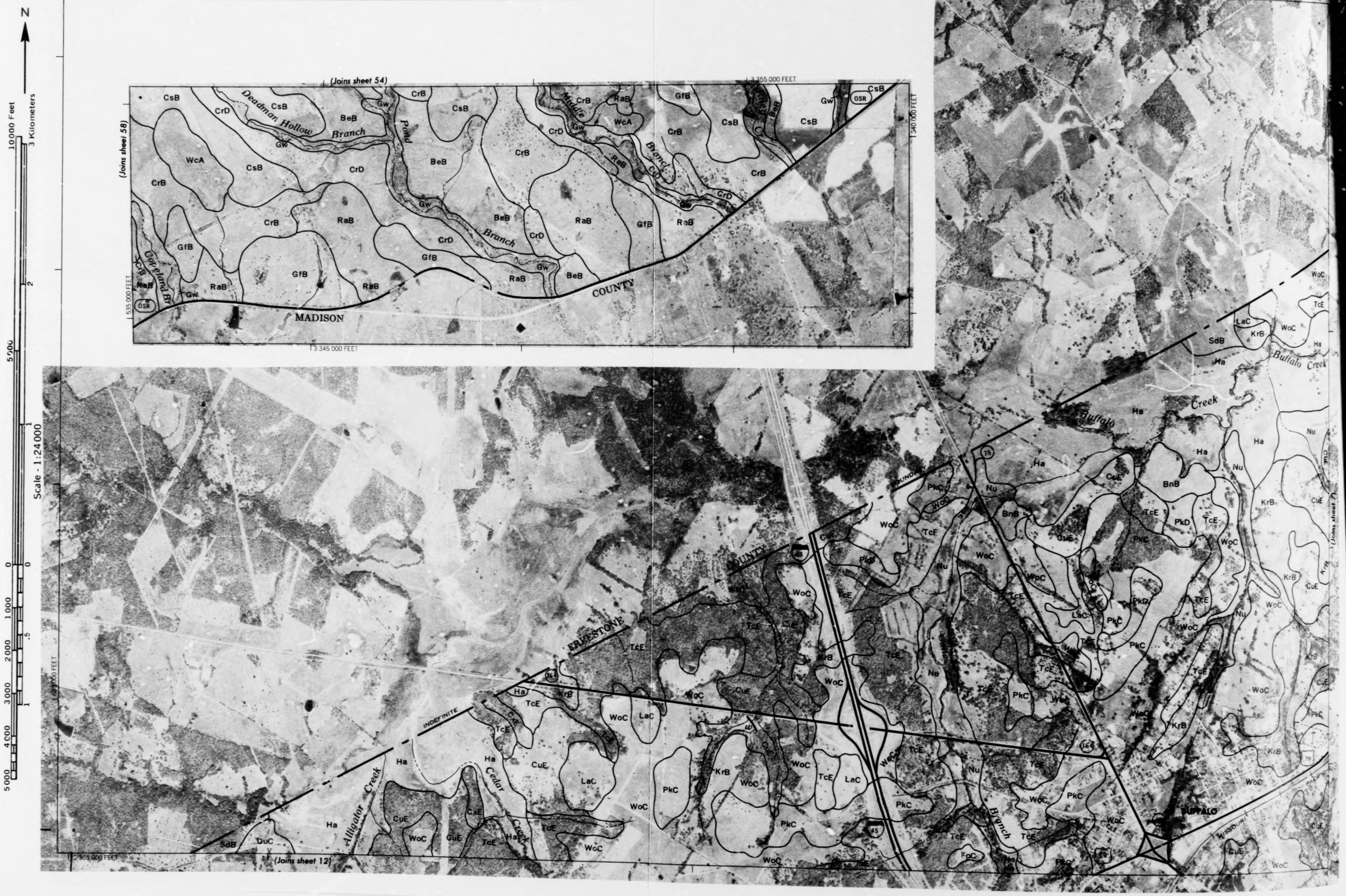

N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000 4000 3000 2000 1000 0 5000
1 .5 0 1 2
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 9)
3 420 000 FEET
North West Fork
Boons Creek
Ringgold Creek
Zuesca Creek
Birch Creek
Eads Creek
Red Branch Community
Timesville Community
Water
831
542
ToC
PkC
PkD
WoC
TcE
CuE
CxE
LaC
KrB
AxB
AxD
AtB
AtD
BnB
BuA
BuB
Rd
Df
De
GaA
Kf
Ha
Na
OkB
RaB
TaB
ChB
MaA
Ms

LEON COUNTY, TEXAS — SHEET NUMBER 5

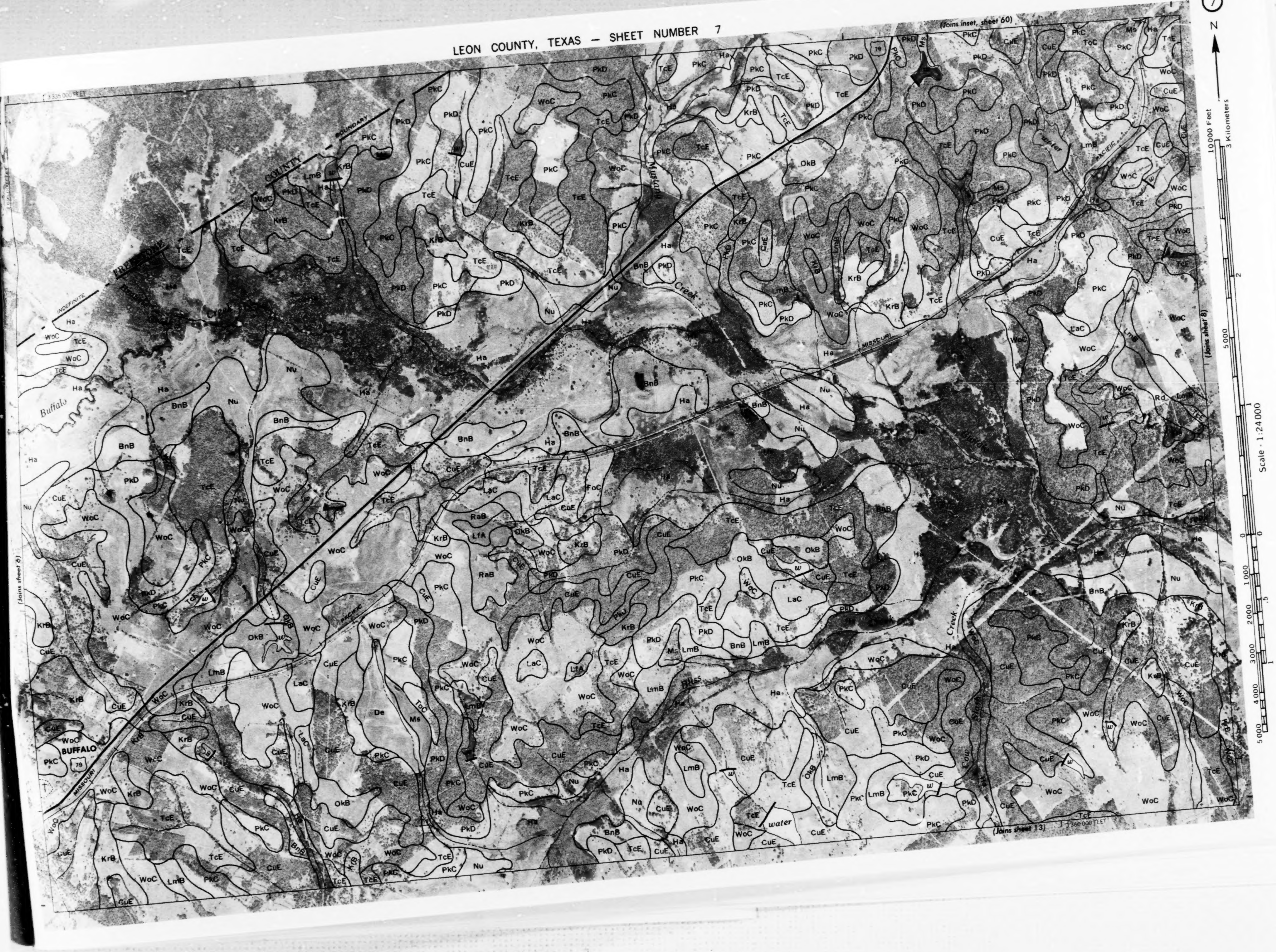

(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 10)
(Joins sheet 2)
3 425 000 FEET
750 000 FEET
3 435 000 FEET
705 000 FEET
3 450 000 FEET
Criminal Lake
TRINITY
RIVER
COUNTY
ANDERSON
TRINITY
RIVER
ANDERSON
COUNTY
RIVER
TRINITY
North
Fork
Shiloh Community
BnB
RaB
Df
Ka
Kf
Gh
AtB
De
Kg
As
AxA
AxB
BuA
Gg
TaB
AtD
WoC
Ha
Sh
Gp
Rd
N
10 000 Feet
3 Kilometers
Scale 1:24 000
5 000
0
1 000
2 000
3 000
4 000
5 000
2
1
.5
0

⑥

LEON COUNTY, TEXAS — SHEET NUMBER 6

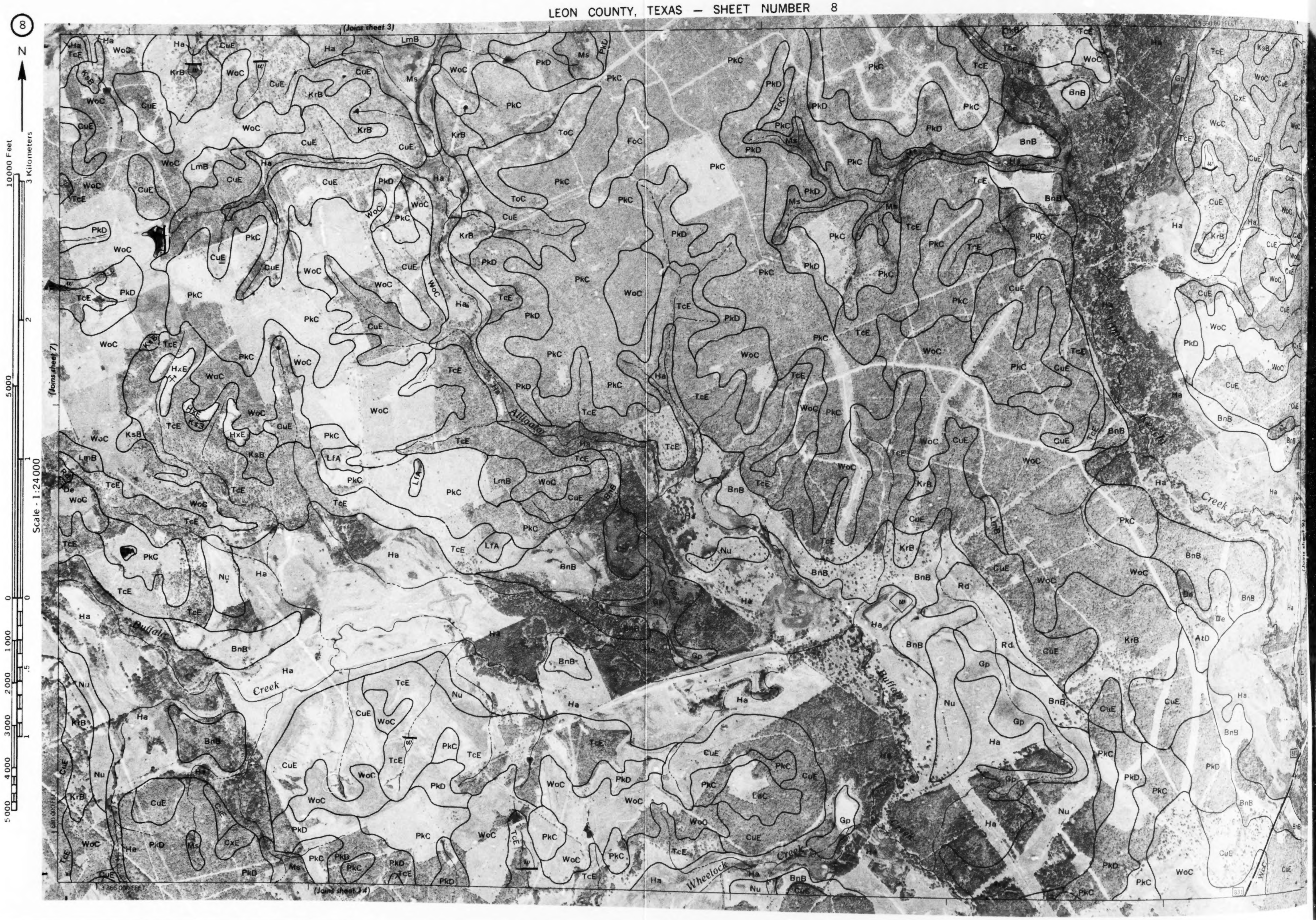

N
Scale - 1:24000
10 000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
2
1
.5
0
(Joins sheet 54)
(Joins sheet 58)
(Joins sheet 12)
(Joins sheet 7)
3 355 000 FEET
540 000 FEET
535 000 FEET
3 345 000 FEET
3 365 000 FEET
Deadman Hollow Branch
Pond Branch
Middle Branch
Copeland Br
MADISON COUNTY
FREESTONE COUNTY
INDEFINITE BOUNDARY
Buffalo Creek
Alligator Creek
Cedar Creek
Branch
BUFFALO
OSR
CsB
CrD
CrB
BeB
Gw
WcA
RaB
GfB
Cu
Ha
SdB
LaC
KrB
WoC
TcE
Nu
CuE
BnB
PkC
PkD
LsC
DuC
GuE
FoC
75
45
79
164

LEON COUNTY, TEXAS — SHEET NUMBER 7


(Joins inset, sheet 60)
(Joins sheet 8)
(Joins sheet 13)
(Joins sheet 6)
N
10000 Feet
3 Kilometers
Scale 1:24 000
5000
1000
0
1
2
3
4000
3000
2000
.5
BUFFALO
79
FREESTONE COUNTY BOUNDARY
INDEFINITE
MISSOURI
PACIFIC
Buffalo
Creek
Hills
water
PkC
PkD
TcE
WoC
CuE
KrB
LmB
Ha
Nu
BnB
OkB
LaC
RaB
LfA
De
Ms
ToC
FoC
Rd
w

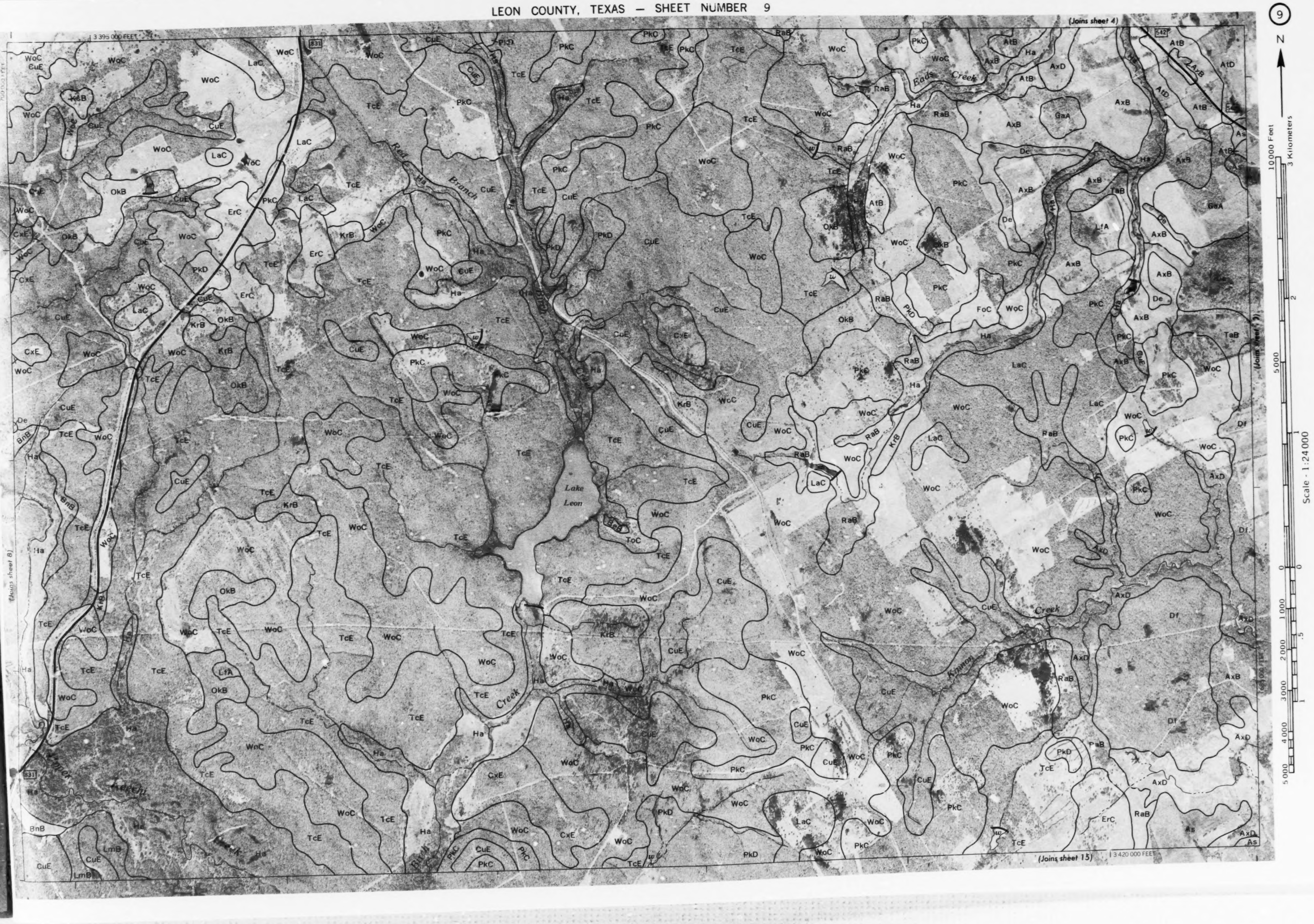
⑧

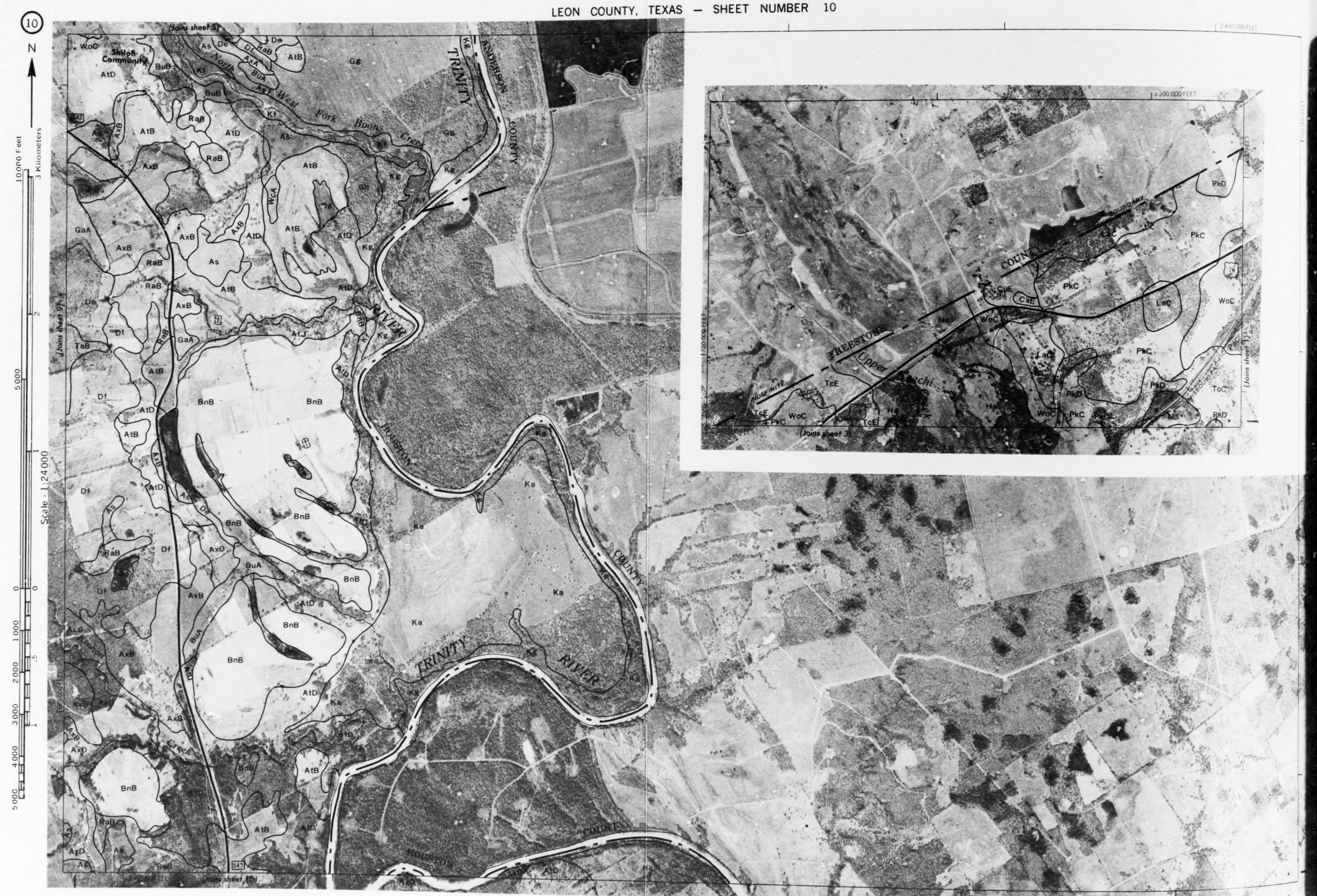
LEON COUNTY, TEXAS — SHEET NUMBER 8


N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000
4000
3000
2000
1000
0
1
.5
2
(Joins sheet 3)
(Joins sheet 7)
(Joins sheet 14)
(Joins sheet 9)
Alligator
Creek
Buffalo
Creek
Wheelock
Creek
PkC
PkD
WoC
CuE
TcE
Ha
BnB
KrB
Nu
Gp
Rd
LmB
LfA
Ms
ToC
FoC
HxE
KsB
CxE
De
AtD
LeC

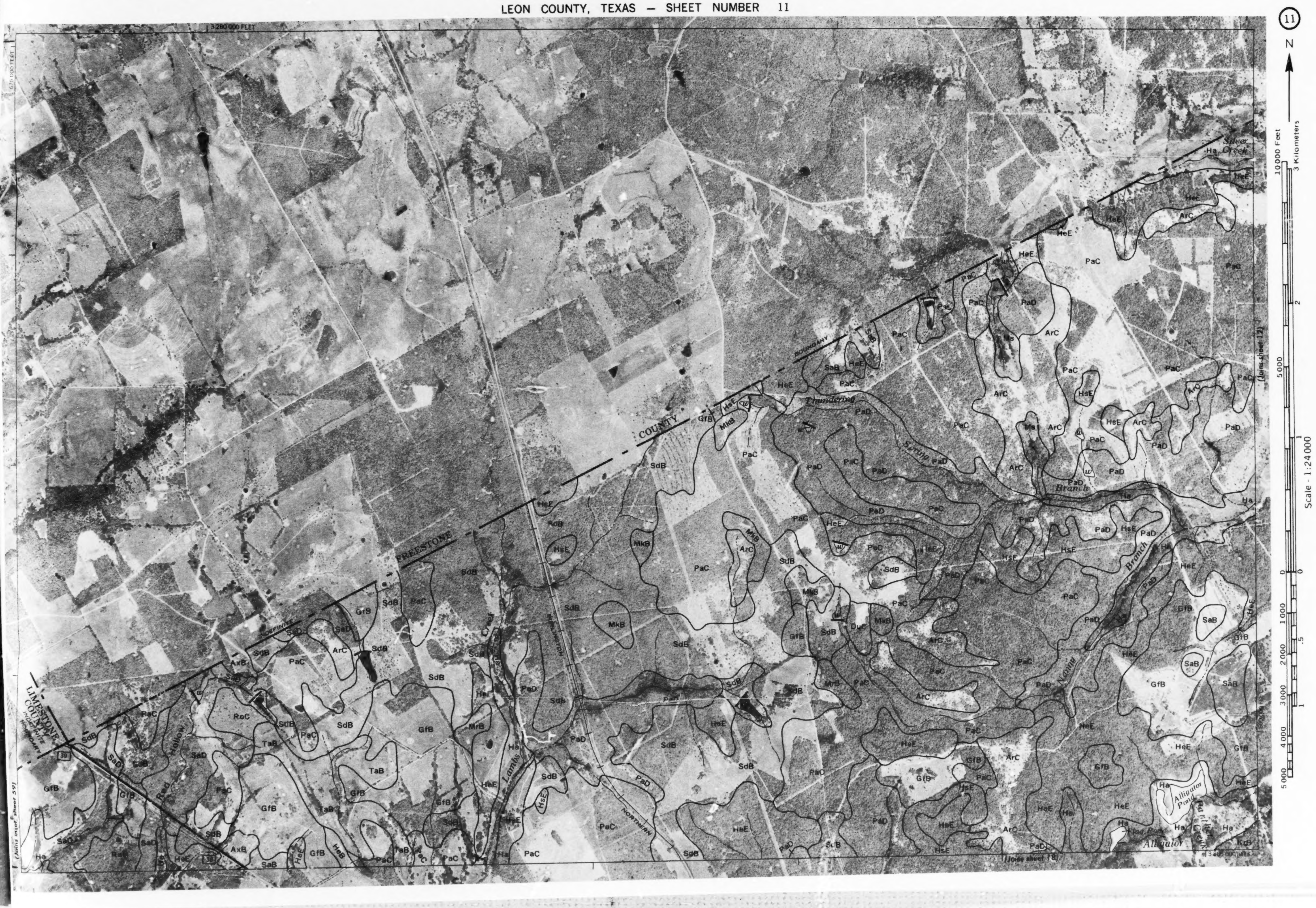
LEON COUNTY, TEXAS — SHEET NUMBER 9

⑨

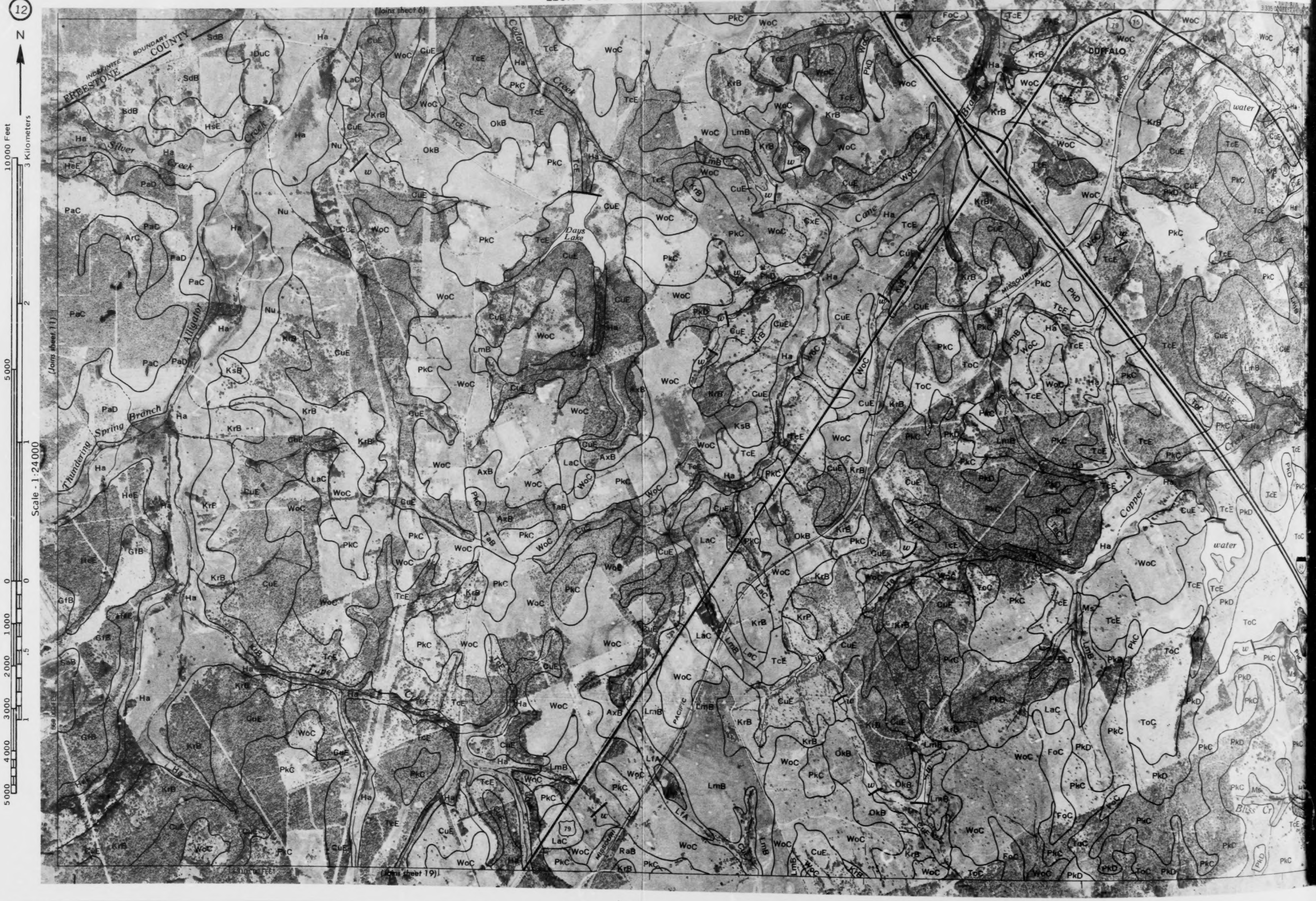

(Joins sheet 4)
(Joins sheet 15)
(Joins sheet 8)
(Joins sheet 10)
3 395 000 FEET
3 420 000 FEET
N
Red Branch
Bads Creek
Lake Leon
Keechi Creek
Creek
Scale 1:24 000
10 000 Feet
3 Kilometers
WoC
TcE
CuE
PkC
LaC
OkB
KrB
ErC
CxE
Ha
AxB
AxD
AtB
RaB
Df
De


10
N
10,000 Feet
3 Kilometers
Scale - 1:24000
5000
1000
2000
3000
4000
(Joins sheet 5)
(Joins sheet 9)
(Joins sheet 12)
(Joins sheet 3)
(Joins sheet 11)
Shiloh Community
North
West
Fork
Boons
Creek
TRINITY
RIVER
ANDERSON
COUNTY
HOUSTON
COUNTY
FREESTONE
COUNTY
BOUNDARY
Upper
Keechi
Creek
3 450 000 FEET
3 390 000 FEET
542
WoC
AtD
AtB
AxB
BuB
RaB
GaA
As
De
Df
TaB
BnB
BuA
AxD
Gg
Kf
Kg
Ka
WcA
PkC
PkD
LaC
CxE
CuE
TcE
He
ToC

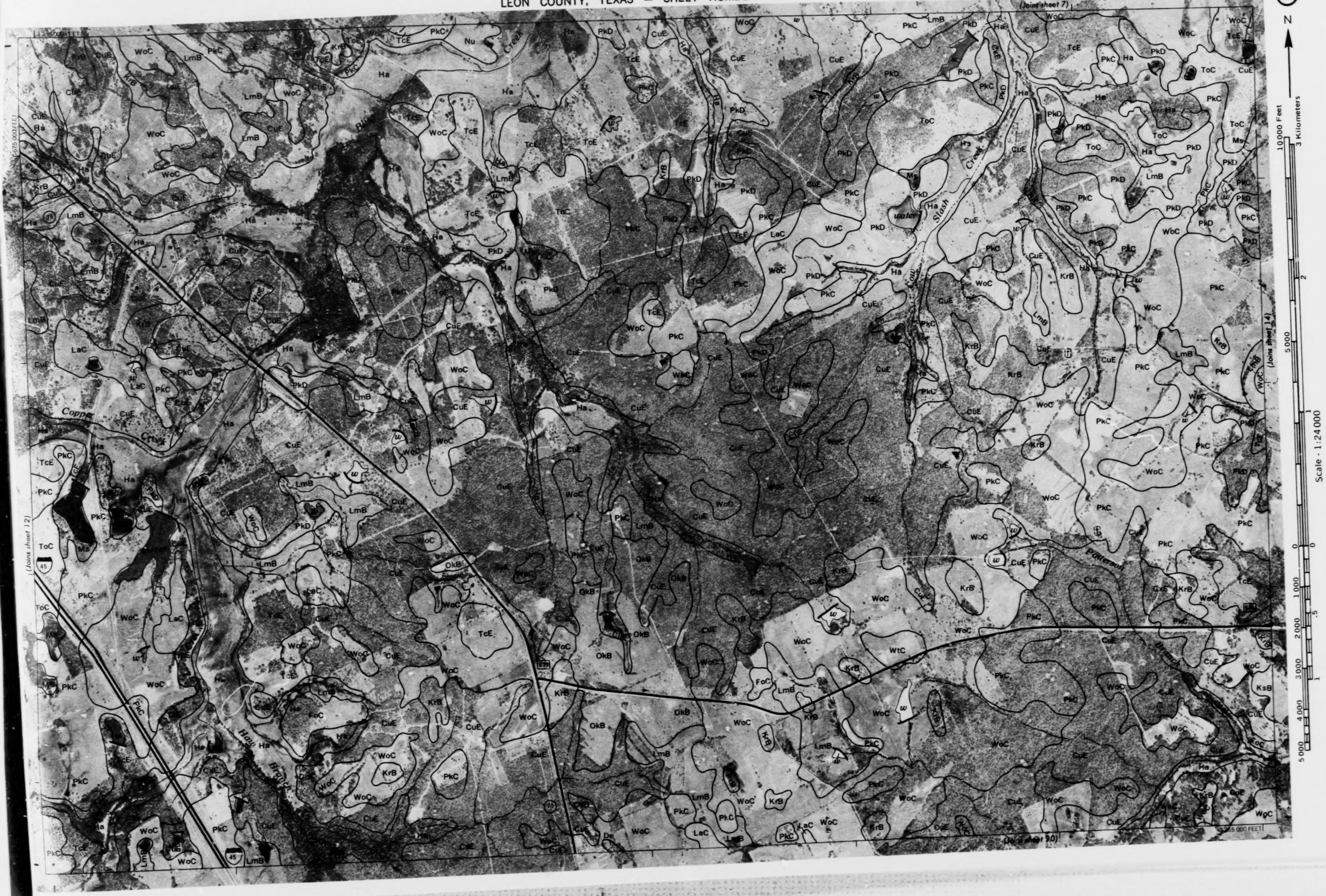
LEON COUNTY, TEXAS — SHEET NUMBER 11


N
3 280 000 FEET
FREESTONE
COUNTY
BOUNDARY
LIMESTONE COUNTY
Silver Creek
Thundering
Spring
Branch
Young
Branch
Red Hollow
Lambs
Alligator Pond
Alligator
(Joins sheet 12)
(Joins sheet 18)
(Joins inset sheet 5)
NORTHERN
39
10000 Feet
3 Kilometers
Scale 1:24000
5000
0
1000
2000
3000
4000
5000
0
.5
1
2
3
PaC
PaD
HeE
HsE
ArC
SdB
SaB
GfB
MkB
MrB
AxB
RoC
TaB
Ha
ReE

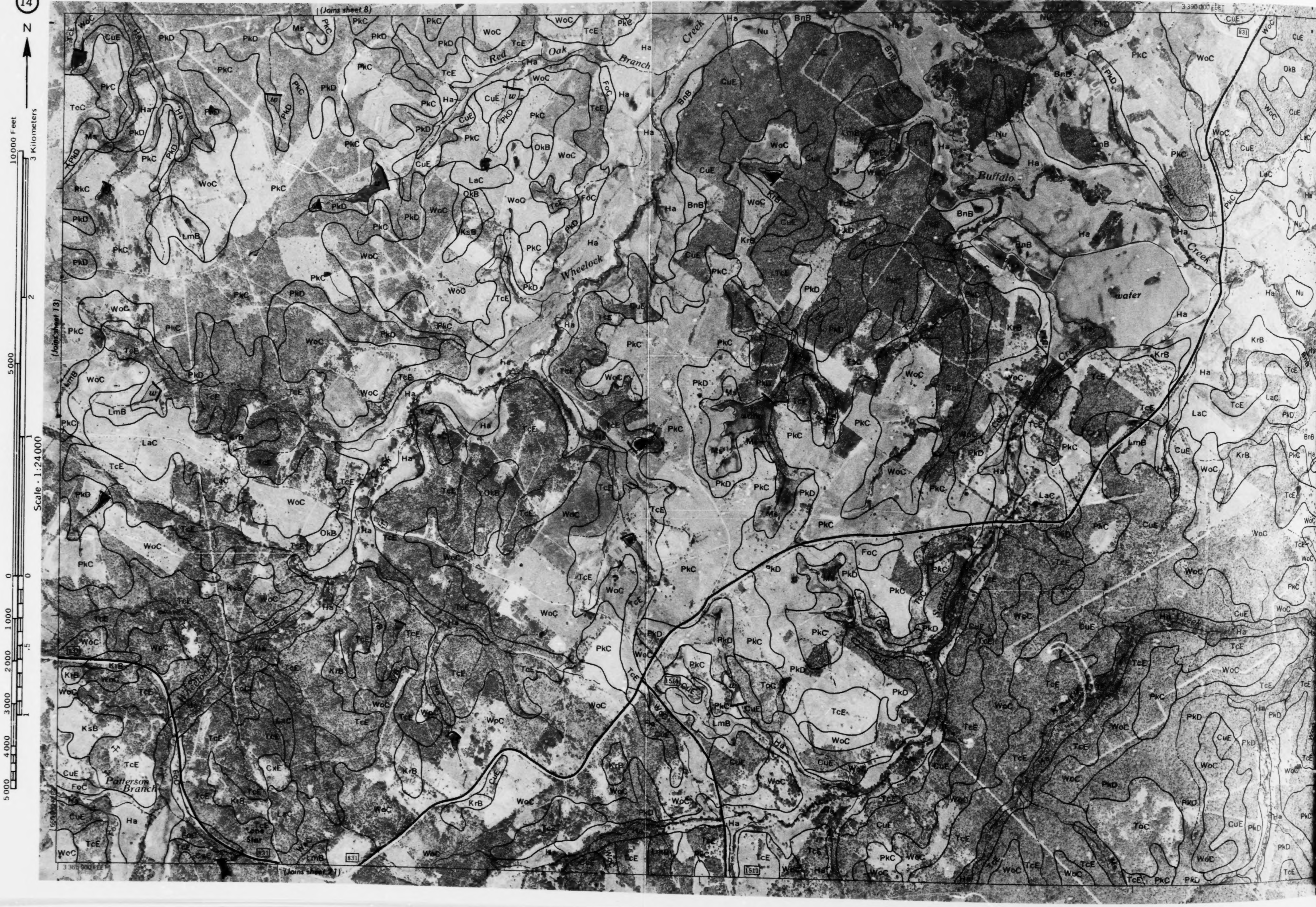
LEON COUNTY, TEXAS — SHEET NUMBER 12


N
Scale 1:24000
10000 Feet
3 Kilometers
5000
2
1
0
1000
2000
3000
4000
5000
.5
(Joins sheet 6)
(Joins sheet 11)
(Joins sheet 19)
INDEFINITE BOUNDARY
FREESTONE COUNTY
Silver Creek
Alligator
Thundering Spring Branch
Cedar Creek
Days Lake
Cane
BUFFALO
MISSOURI PACIFIC
Copper
Bliss Cr
water
79
45

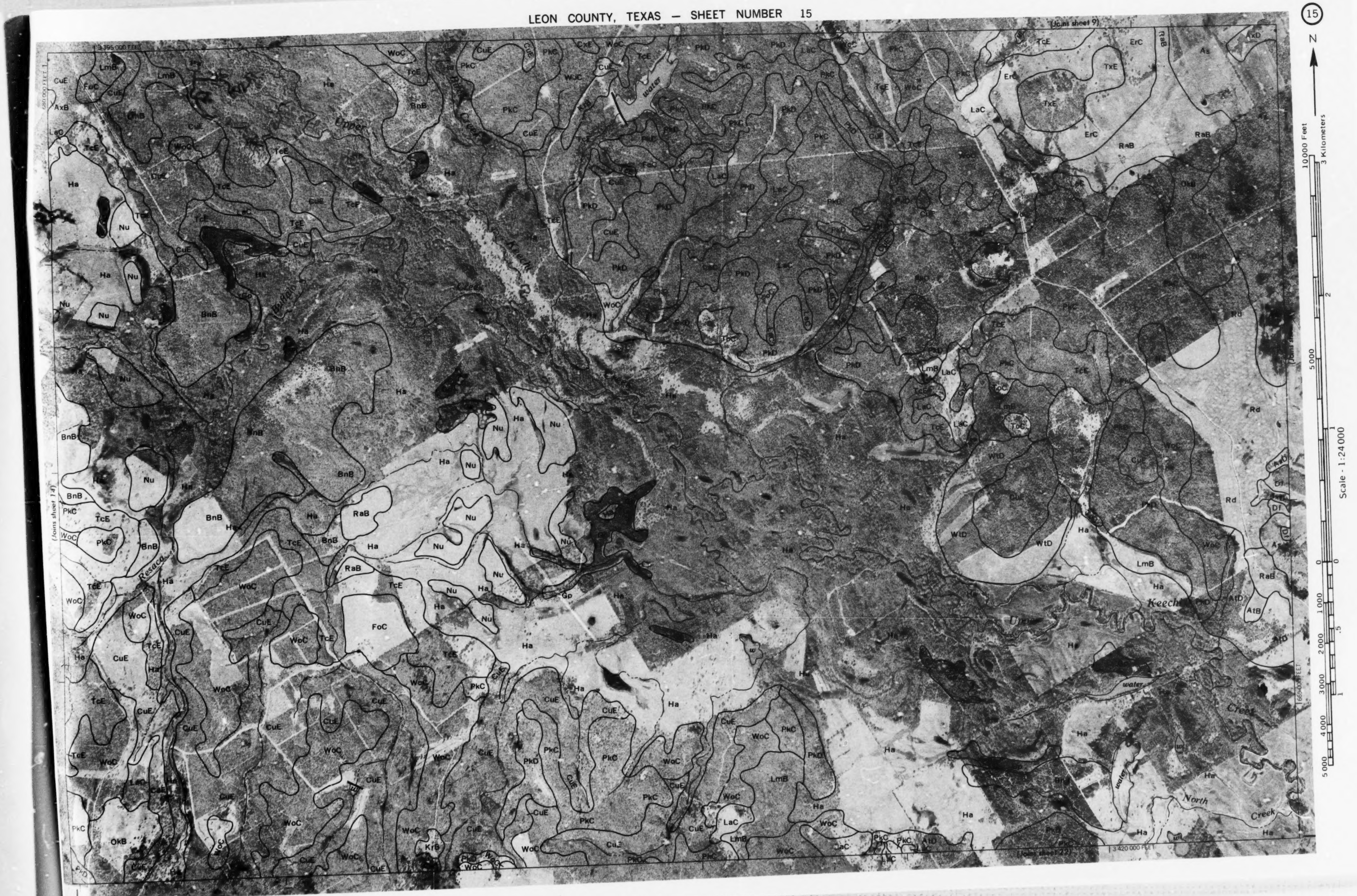
LEON COUNTY, TEXAS — SHEET NUMBER 13


(Joins sheet 7)
(Joins sheet 12)
(Joins sheet 14)
(Joins sheet 20)
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
Copper Creek
Cow Slash Creek
Hall Branch
water
45

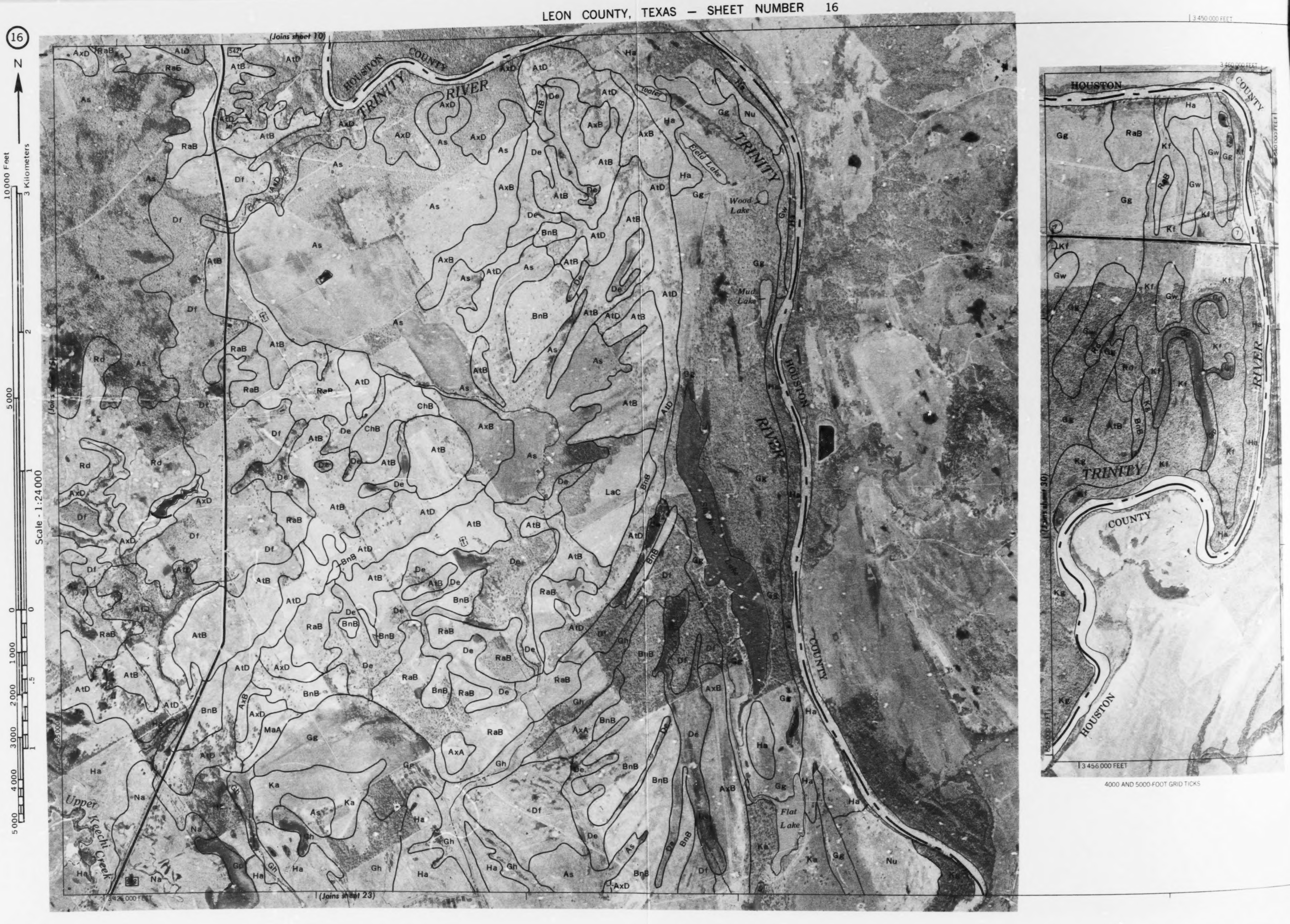
LEON COUNTY, TEXAS — SHEET NUMBER 14


N
10 000 Feet
3 Kilometers
Scale 1:24000
(Joins sheet 8)
(Joins sheet 13)
(Joins sheet 21)
3 390 000 FEET
3 360 000 FEET
Red Oak Branch
Wheelock
Creek
Buffalo Creek
water
Patterson Branch
Lone Star
831
1511
PkC
PkD
WoC
TcE
CuE
Ha
BnB
Nu
KrB
LaC
LmB
OkB
KsB
FoC
Ms
ToC

LEON COUNTY, TEXAS — SHEET NUMBER 15

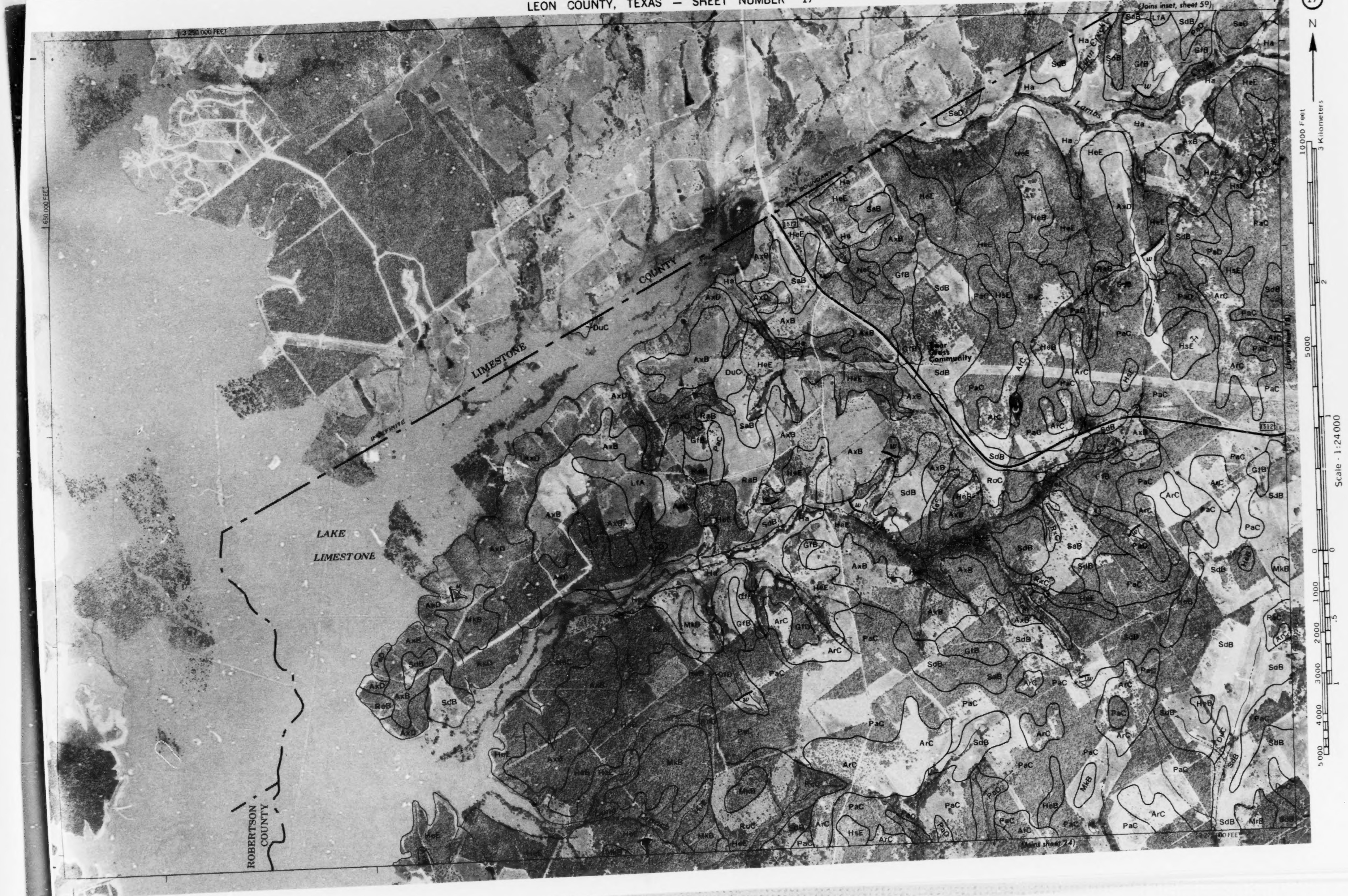

(Joins sheet 9)
(Joins sheet 14)
(Joins sheet 22)
3 395 000 FEET
3 420 000 FEET
N
Scale - 1:24 000
10 000 Feet
5 000
4 000
3 000
2 000
1 000
0
3 Kilometers
2
1
.5
Upper
Keechi
Buffalo
Resaca
Creek
North
water
Ha
Nu
BnB
CuE
TcE
PkC
PkD
WoC
LaC
LmB
AxB
AxD
TxE
ErC
RaB
As
Rd
WtD
FoC
Gp
KrB
OkB
AtB
AtD
ToC
Df

LEON COUNTY, TEXAS — SHEET NUMBER 16


16
N
10000 Feet
3 Kilometers
Scale 1:24000
(Joins sheet 10)
(Joins sheet 23)
(Joins sheet 30)
HOUSTON COUNTY
TRINITY RIVER
Field Lake
Wood Lake
Mud Lake
Flat Lake
Upper Keechi Creek
3 450 000 FEET
3 456 000 FEET
3 442 000 FEET

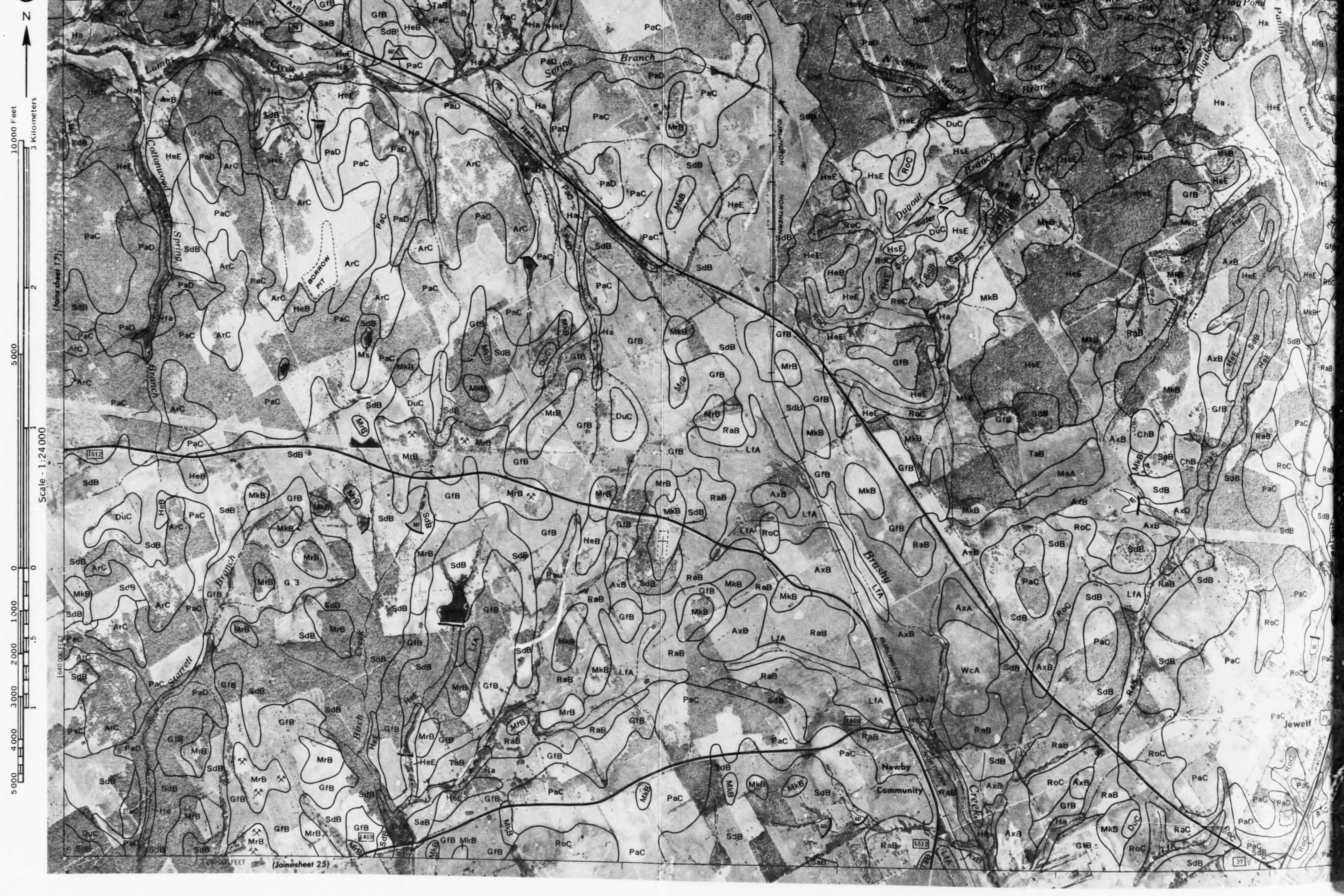
4000 AND 5000-FOOT GRID TICKS

LEON COUNTY, TEXAS — SHEET NUMBER 17

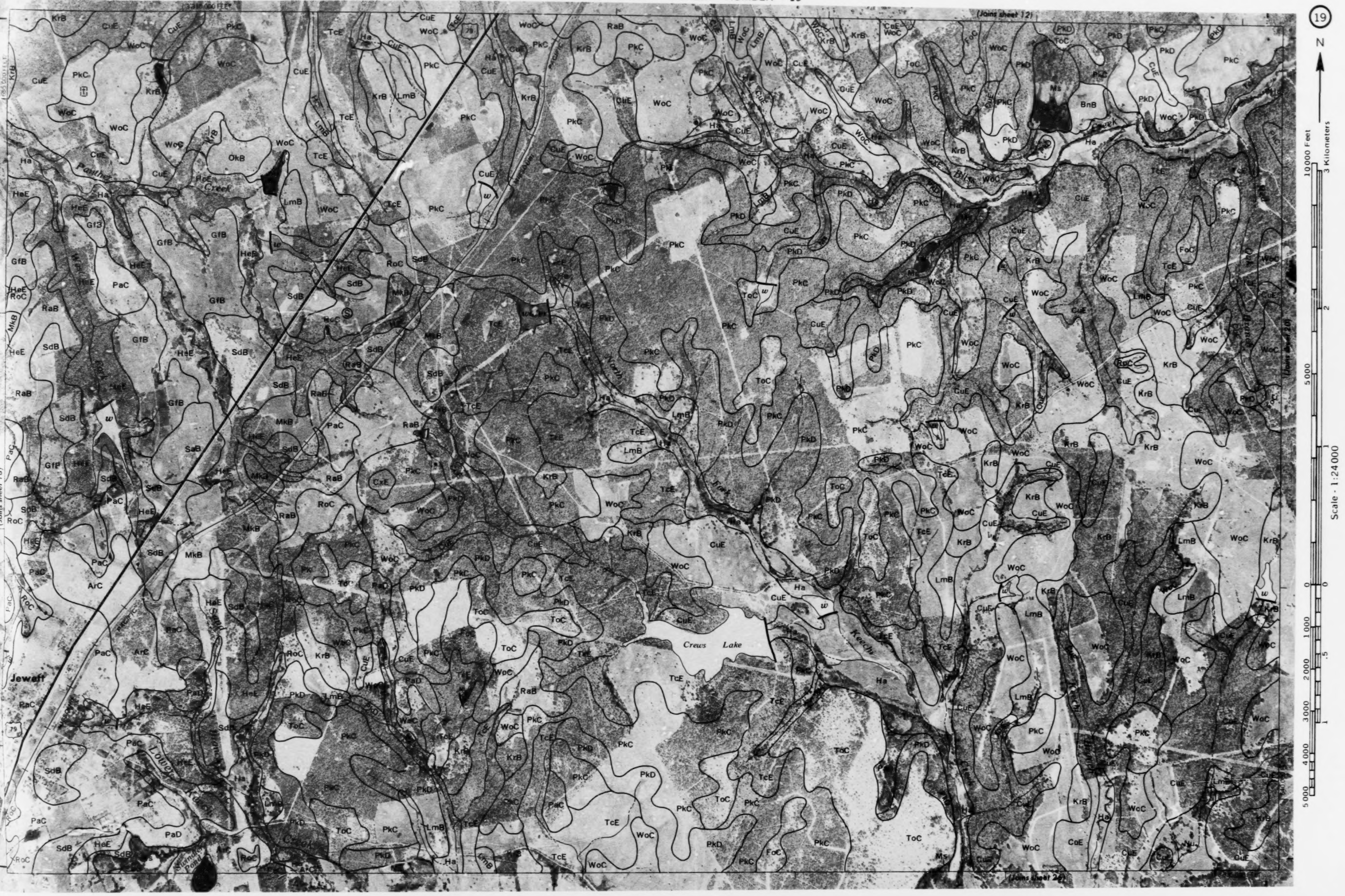

(Joins inset, sheet 59)
(Joins sheet 18)
(Joins sheet 24)
3 250 000 FEET
650 000 FEET
N
LAKE LIMESTONE
LIMESTONE COUNTY BOUNDARY
INDEFINITE
ROBERTSON COUNTY
Lambs Creek
Pleasant Grove Community
1512
3519
10 000 Feet
3 Kilometers
5000
2
1
0
1000
2000
3000
4000
.5
Scale - 1:24000
SdB
PaC
ArC
AxB
AxD
HeE
HeB
HsE
GfB
SaB
SaD
Ha
MkB
DuC
RaB
RoC
LfA
MrB

⑱

LEON COUNTY, TEXAS — SHEET NUMBER 18

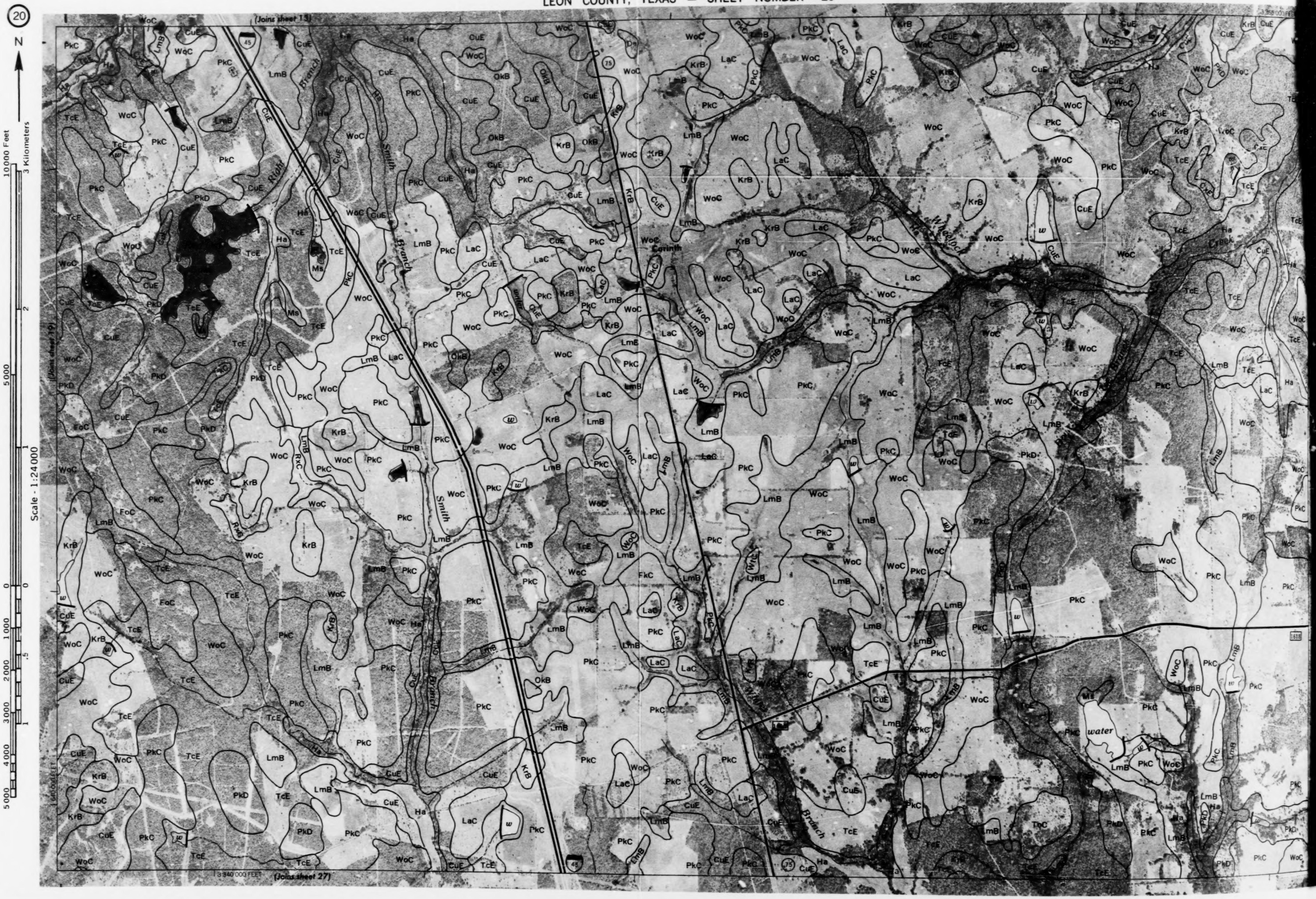

N
10 000 Feet
3 Kilometers
5000
2
1
Scale - 1:24 000
0
1000
2000
3000
4000
5000
.5
(Joins sheet 11)
(Joins sheet 17)
(Joins sheet 25)
640 000 FEET
3 280 000 FEET
Lambs Creek
Spring Branch
Cottonwood Spring Branch
Starrett Branch
Birch Creek
Brushy Creek
Dugout Branch
Alligator Creek
Panther Creek
Flag Pond
Water
BORROW PIT
NORTHERN
BURLINGTON
Newby Community
Jewett
1512
1469
39

LEON COUNTY, TEXAS — SHEET NUMBER 19

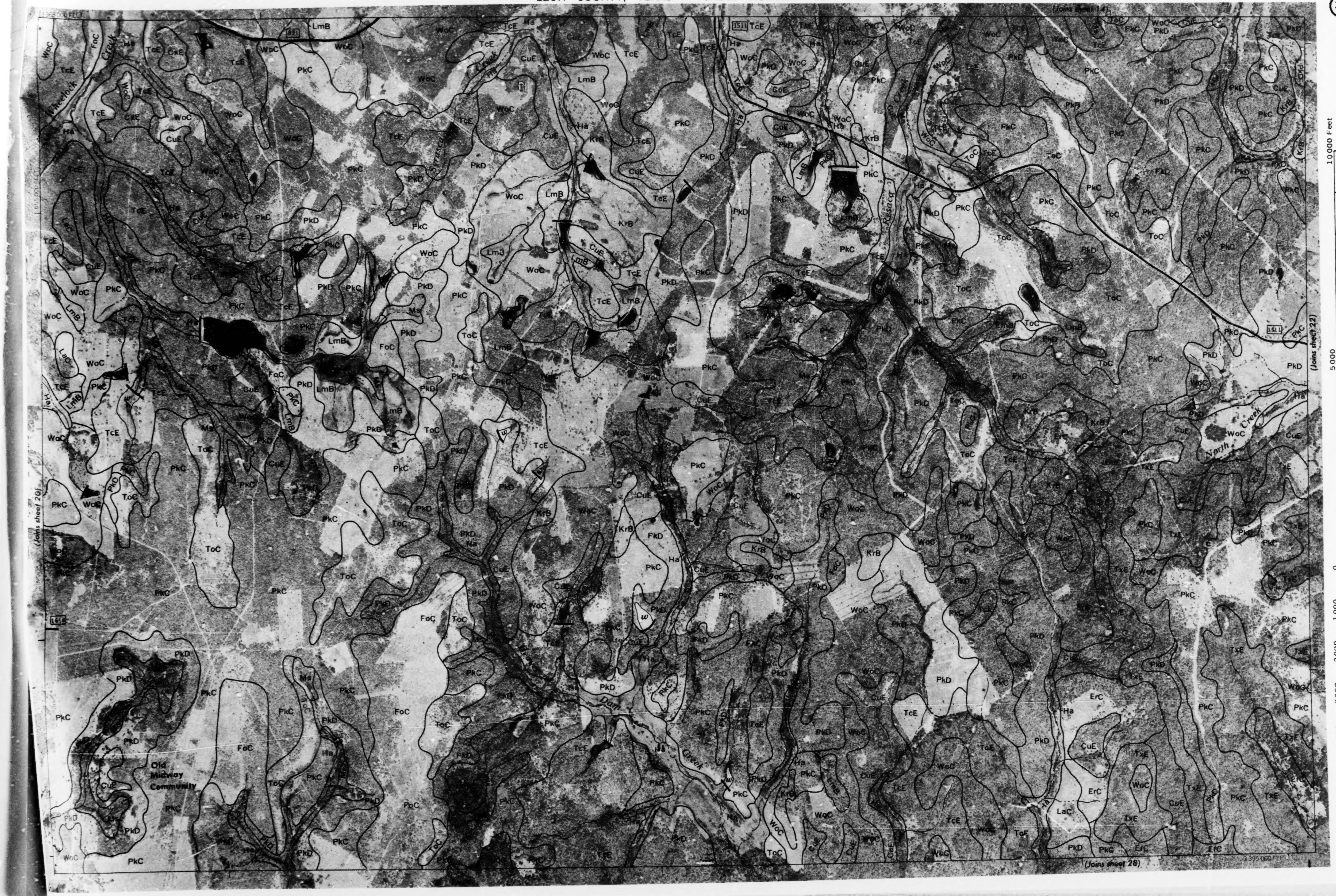

19
N
(Joins sheet 12)
(Joins sheet 18)
(Joins sheet 20)
(Joins sheet 26)
Crews Lake
Jewett
Panther Creek
Keechi Creek
Scale - 1:24 000
10 000 Feet
5000
0
1000
2000
3000
4000
5000
3 Kilometers
2
1
.5
0
ArC
BnB
CuE
FoC
GfB
Ha
HeE
KrB
LmB
MkB
Ms
OkB
PaC
PaD
PkC
PkD
RaB
RoC
SdB
TcE
ToC
WoC
w
79

⑳

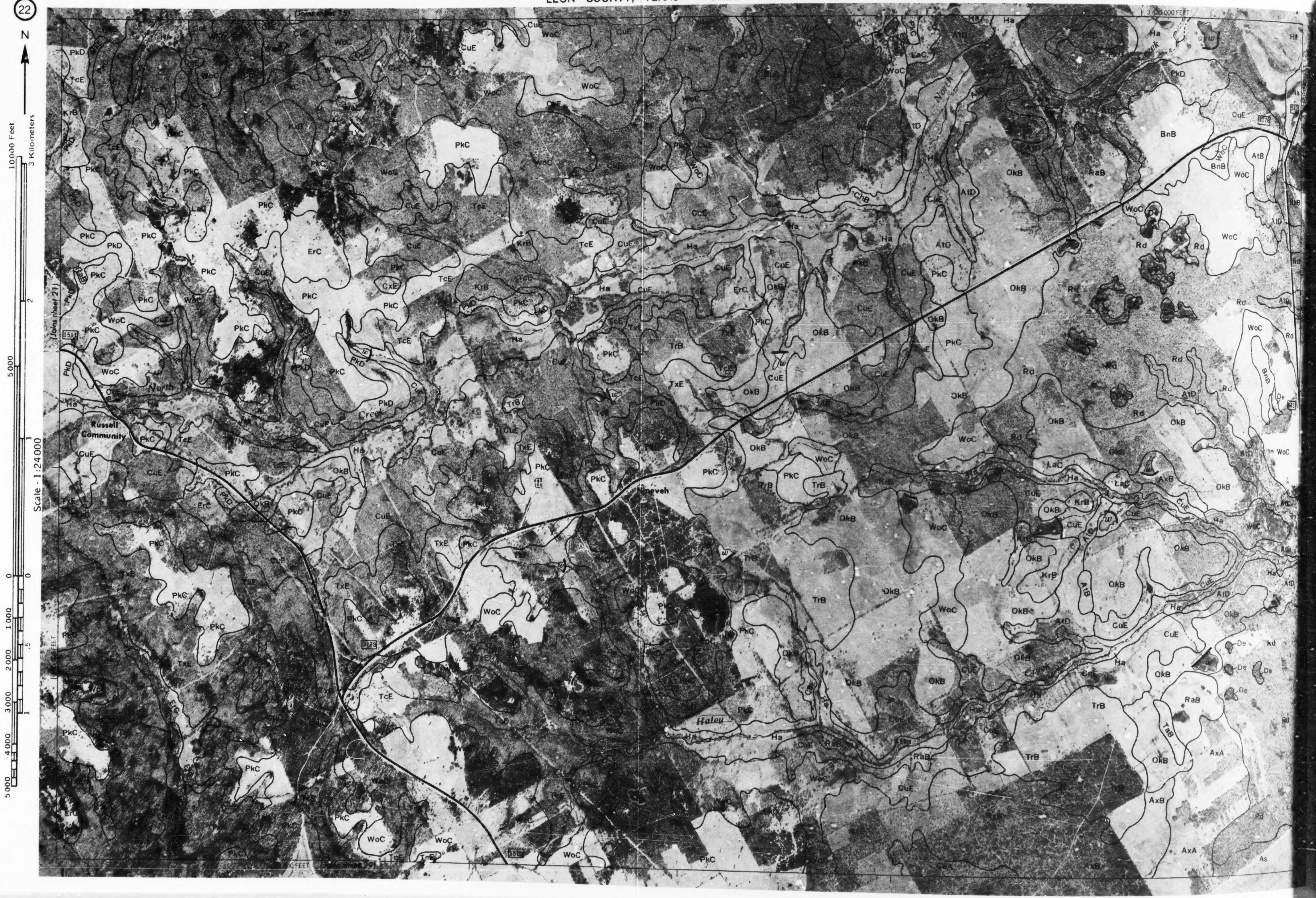
LEON COUNTY, TEXAS — SHEET NUMBER 20


N
(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 27)
3 340 000 FEET
Scale - 1:24 000
10 000 Feet
5000
0
1000
2000
3000
4000
5000
3 Kilometers
2
1
.5
0
45
75
1618
Right Branch
Smith Branch
Corinth
Wheelock Creek
White Branch
water
PkC
WoC
CuE
LmB
TcE
KrB
LaC
Ha
PkD
OkB
FoC
Ms
w

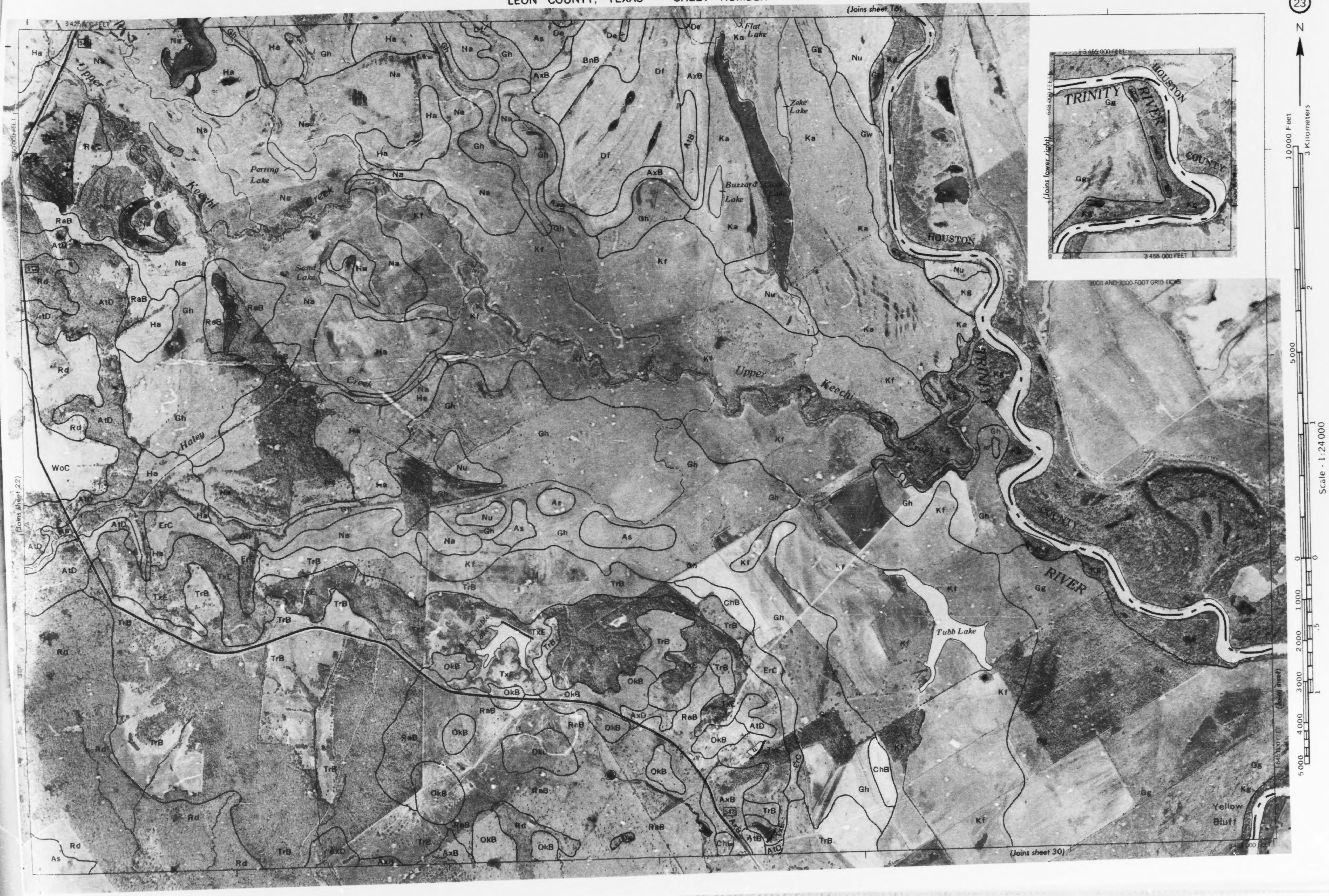
LEON COUNTY, TEXAS — SHEET NUMBER 21


(Joins sheet 14)
(Joins sheet 20)
(Joins sheet 22)
(Joins sheet 28)
3 395 000 FEET
655 000 FEET
Wheelock Creek
Steele Creek
Keechi Creek
North Creek
Dam Creek
Old Midway Community
1511
1614
10 000 Feet
5 000
1 000 0
WoC
FoC
TcE
CuE
Ha
LmB
PkC
PkD
ToC
KrB
LaC
Ms
ErC
TxE
W

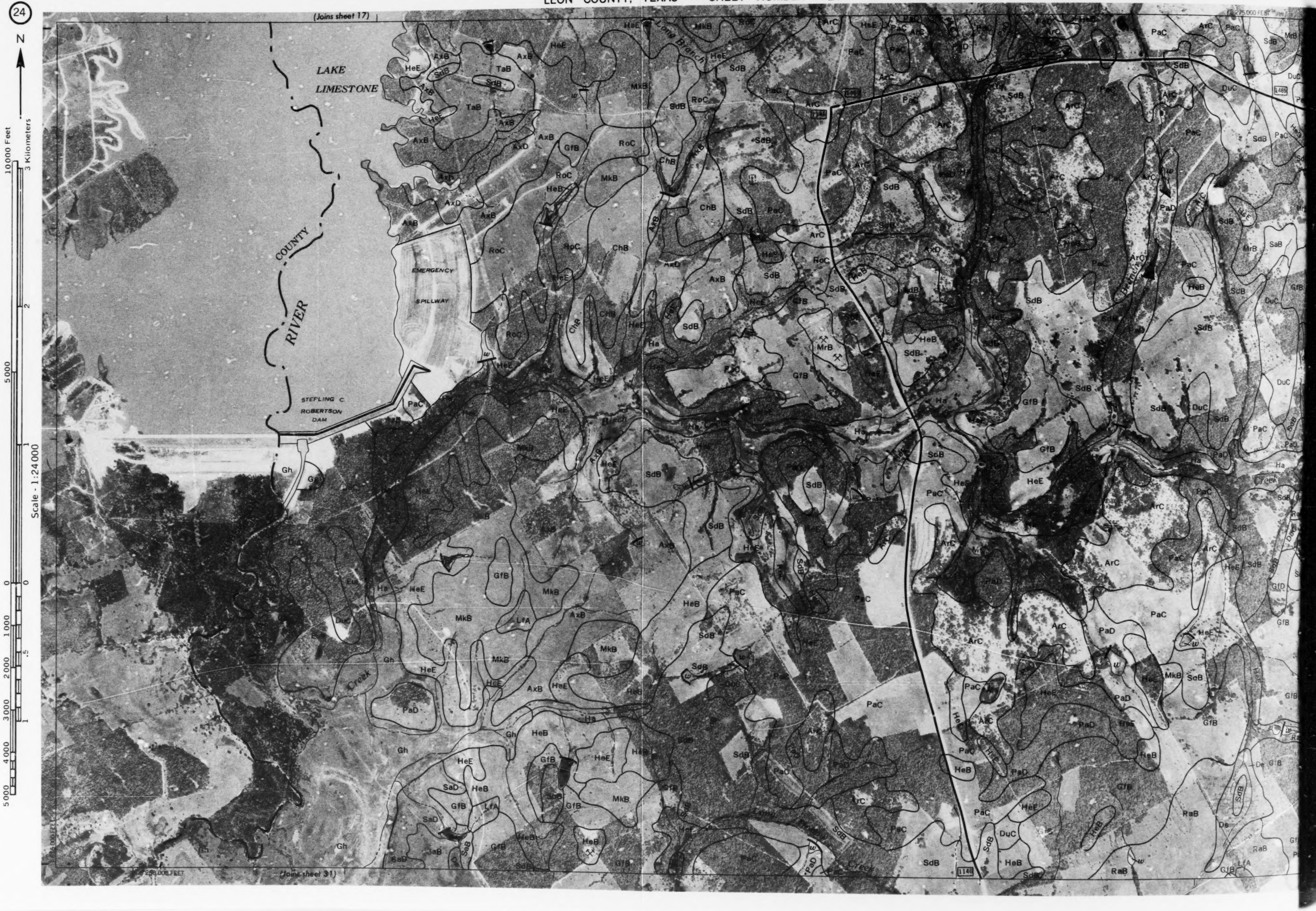
LEON COUNTY, TEXAS — SHEET NUMBER 22


N
10 000 Feet
3 Kilometers
5000
2
1
0
1000
2000
3000
4000
5000
.5
Scale 1:24 000
(Joins sheet 15)
(Joins sheet 21)
3 420 000 FEET
Russell Community
Ninevah
North Creek
Haley
1511
PkD
PkC
TcE
KrB
WoC
CuE
ErC
CxE
TxE
Ha
OkB
TrB
AtD
AtB
BnB
RaB
Rd
LaC
AxB
AxA
TaB
De
As
ChB

LEON COUNTY, TEXAS — SHEET NUMBER 23

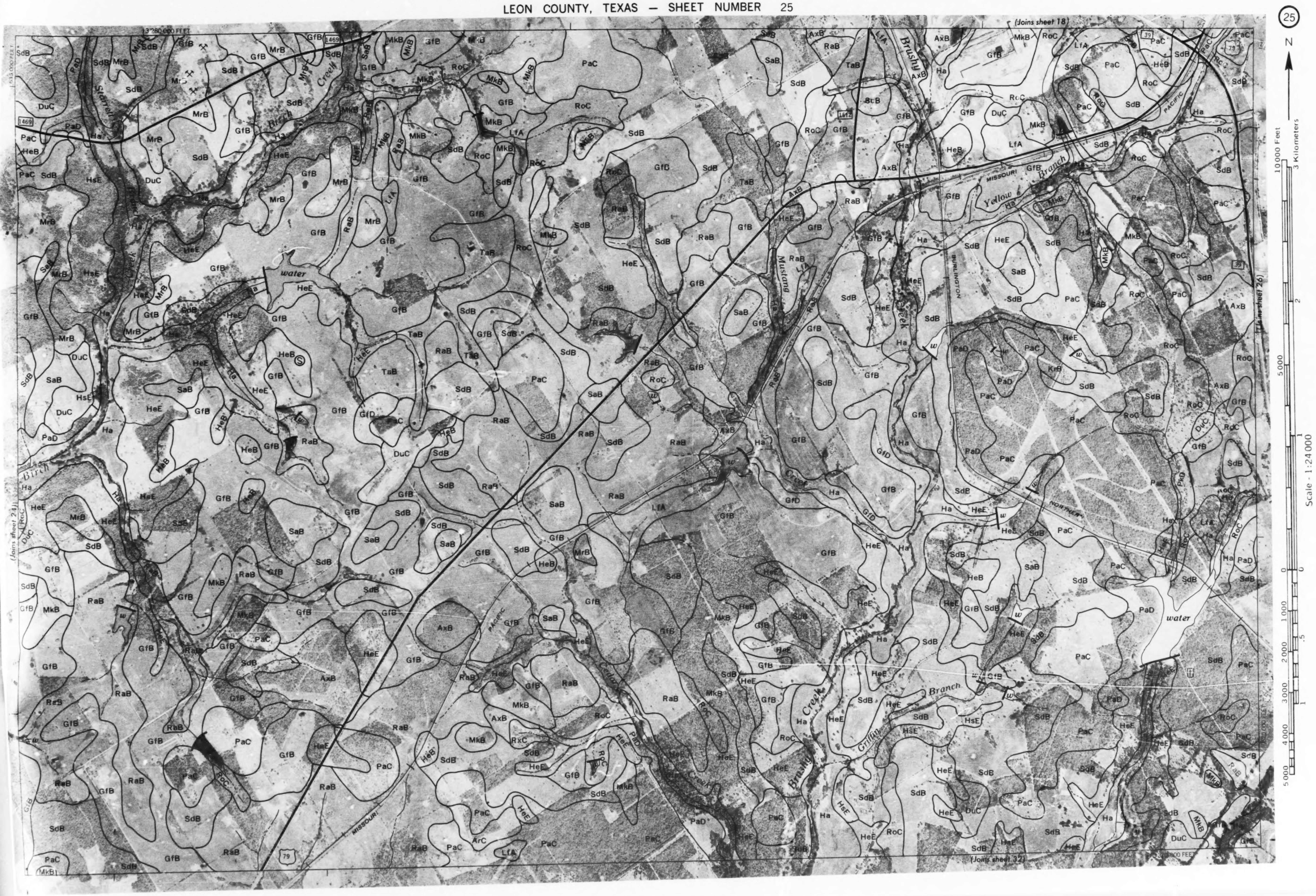

(Joins sheet 16)
(Joins sheet 22)
(Joins sheet 30)
(Joins inset)
(Joins lower right)
3 425 000 FEET
3 455 000 FEET
3 458 000 FEET
3000 AND 2000-FOOT GRID TICKS
N
Scale - 1:24 000
10 000 Feet
3 Kilometers
5 000
0
1 000
2 000
3 000
4 000
5 000
.5
1
2
Upper Keechi Creek
Perring Lake
Sand Lake
Haley Creek
Flat Lake
Zeke Lake
Buzzard Lake
Buzzard Creek Lake
Tubb Lake
Yellow Bluff
TRINITY RIVER
HOUSTON COUNTY
Ha
Na
Gh
Df
De
As
AxB
BnB
Ka
Kf
Kg
Nu
Gg
Gw
Rd
RaB
AtD
ErC
WoC
TrB
TxE
ChB
OkB
AxD

LEON COUNTY, TEXAS — SHEET NUMBER 24

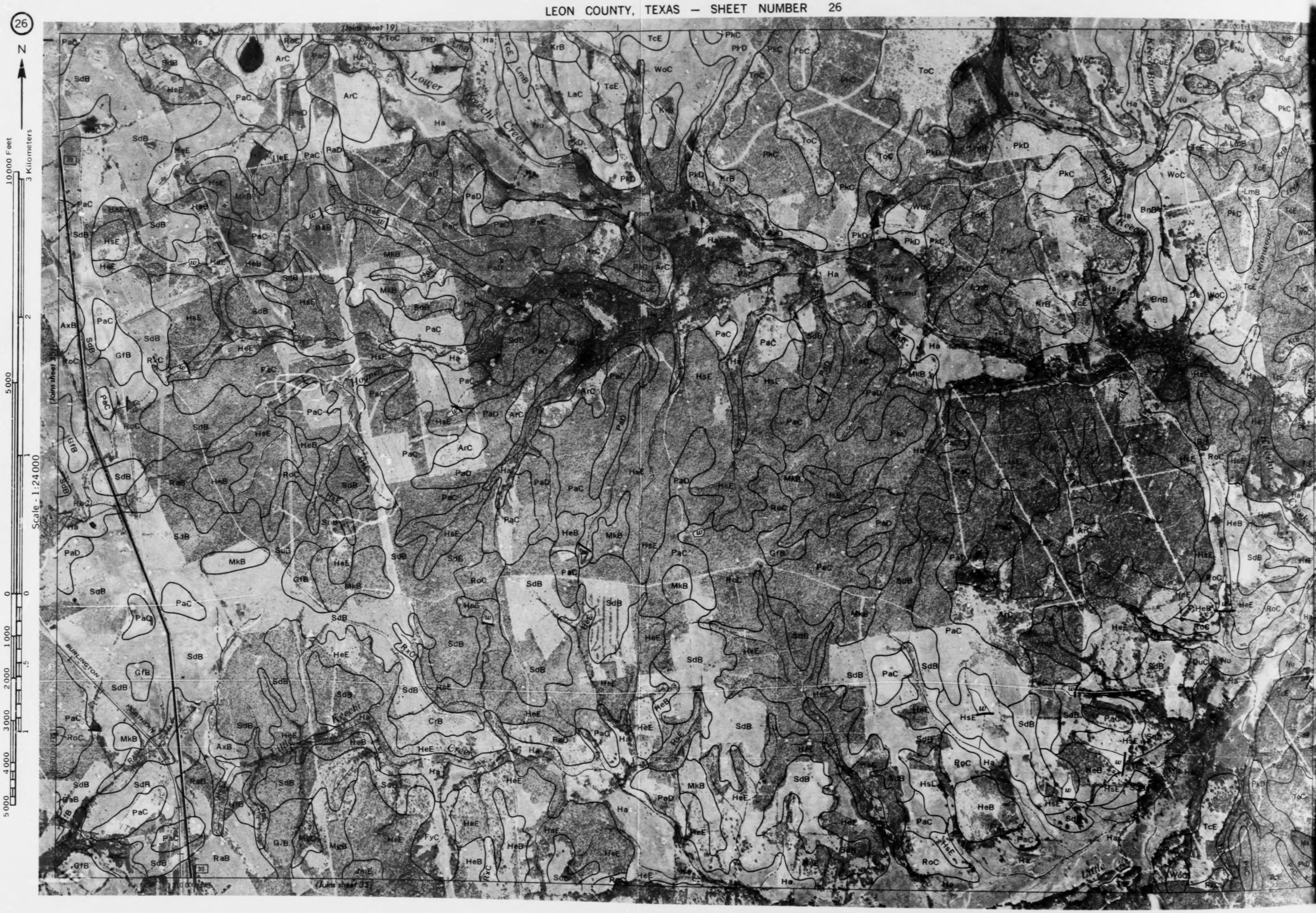


24
N
10 000 Feet
3 Kilometers
Scale 1:24 000
(Joins sheet 17)
(Joins sheet 31)
225 000 FEET
250 000 FEET
LAKE
LIMESTONE
COUNTY
RIVER
EMERGENCY
SPILLWAY
STERLING C.
ROBERTSON
DAM
Long Branch
Creek
L146
L489
ArC
AxB
AxD
ChB
DuC
GfB
Gh
Ha
HeB
HeE
LfA
MkB
MrB
PaC
PaD
RaB
RoC
SaB
SaD
SdB
TaB
De
w

LEON COUNTY, TEXAS — SHEET NUMBER 25

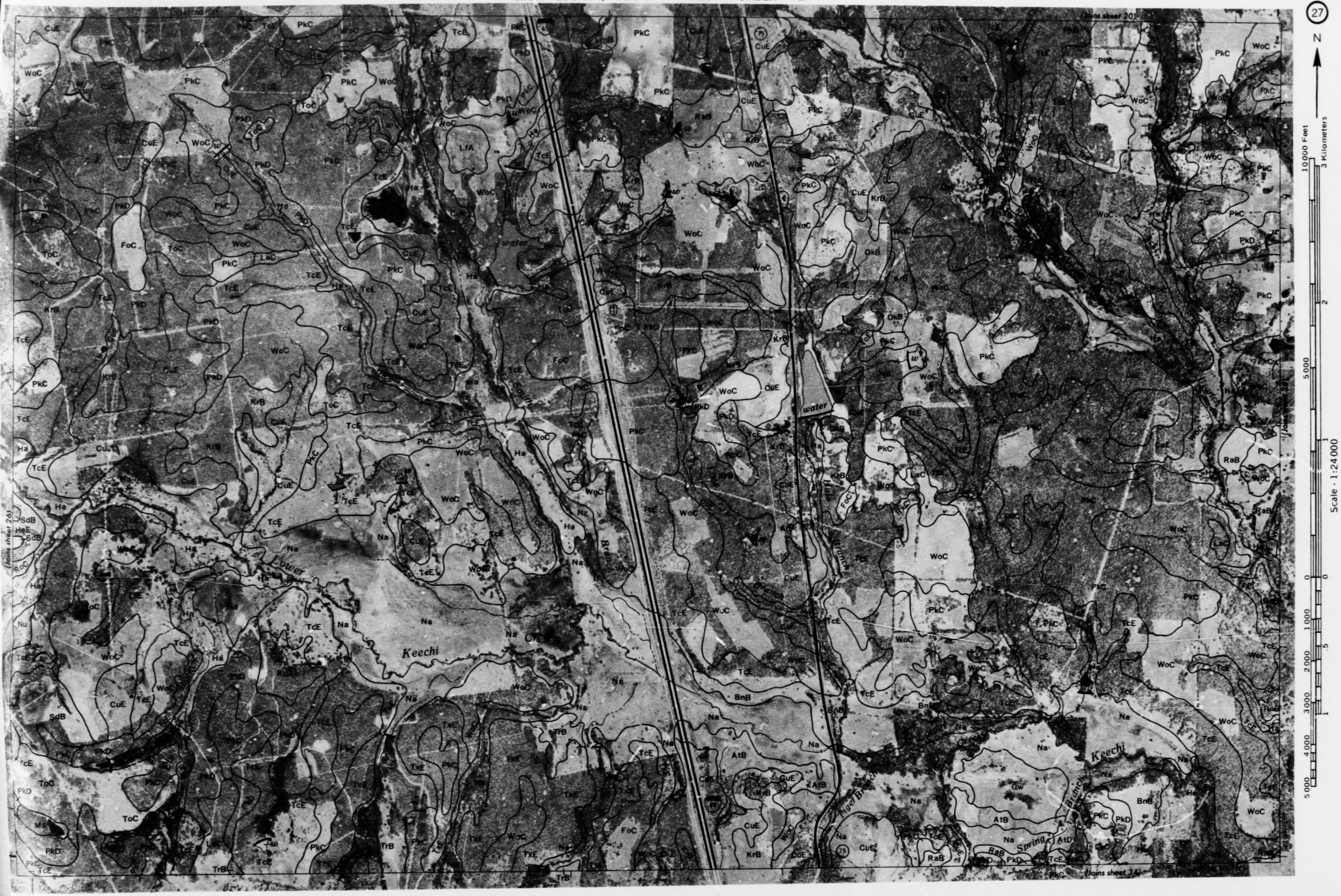

(Joins sheet 18)
(Joins sheet 26)
(Joins sheet 32)
(Joins sheet 24)
N
10000 Feet
3 Kilometers
Scale - 1:24 000
5000
1000
0
2000
3000
4000
5000
3 280 000 FEET
Birch Creek
Mustang Creek
Yellow Branch
Brushy Creek
Griffin Branch
Creek
water
MISSOURI PACIFIC
BURLINGTON NORTHERN
79
39
1469
1512

LEON COUNTY, TEXAS — SHEET NUMBER 26

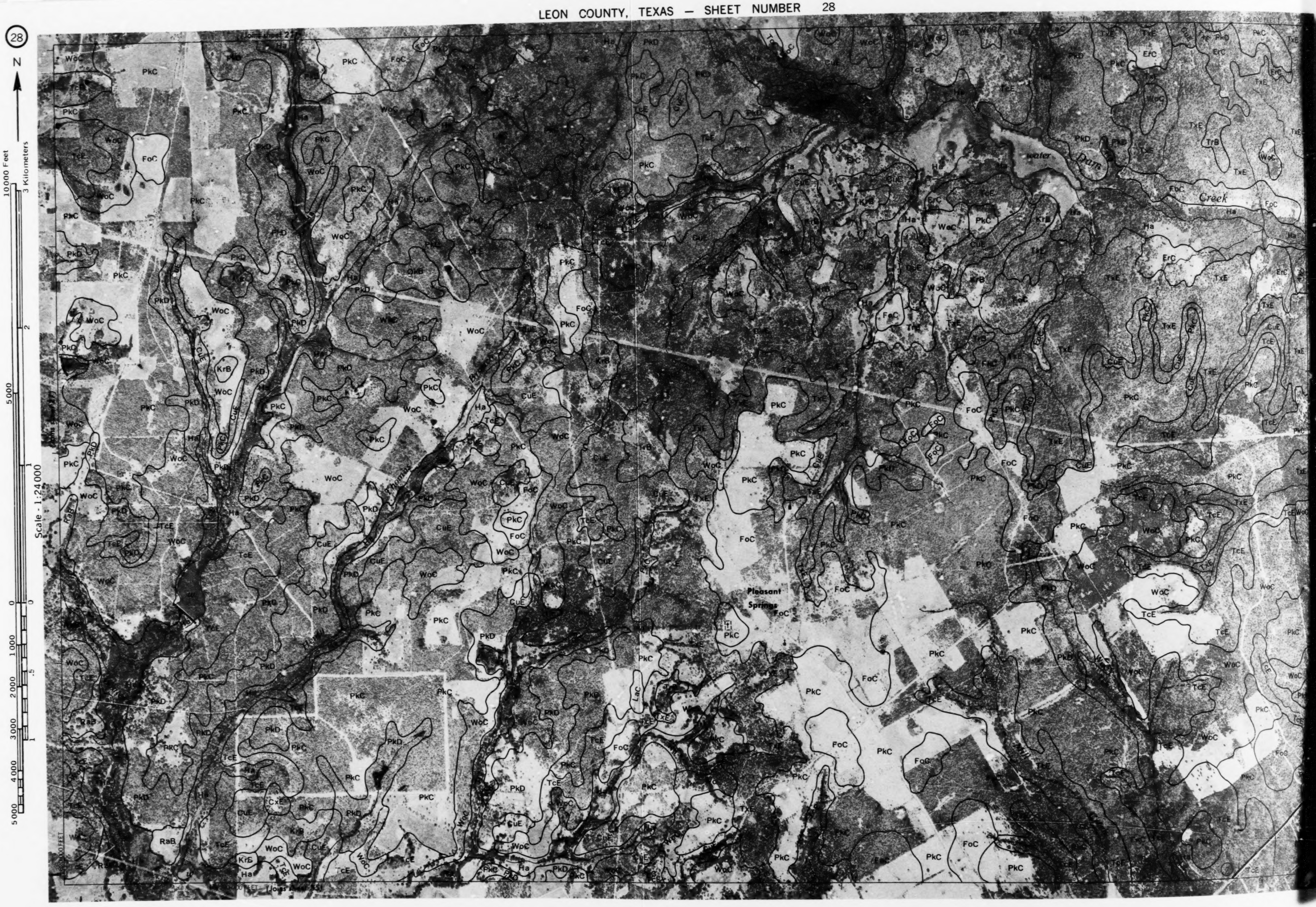


(26)
N
10 000 Feet
3 Kilometers
5000
Scale 1:24 000
0
1000
2000
3000
4000
5000
(Joins sheet 19)
(Joins sheet 33)
Lower Keechi Creek
North Fork Keechi Creek
Cottonwood
Hopson
Keechi Creek
Little Keechi Creek
BURLINGTON NORTHERN
39

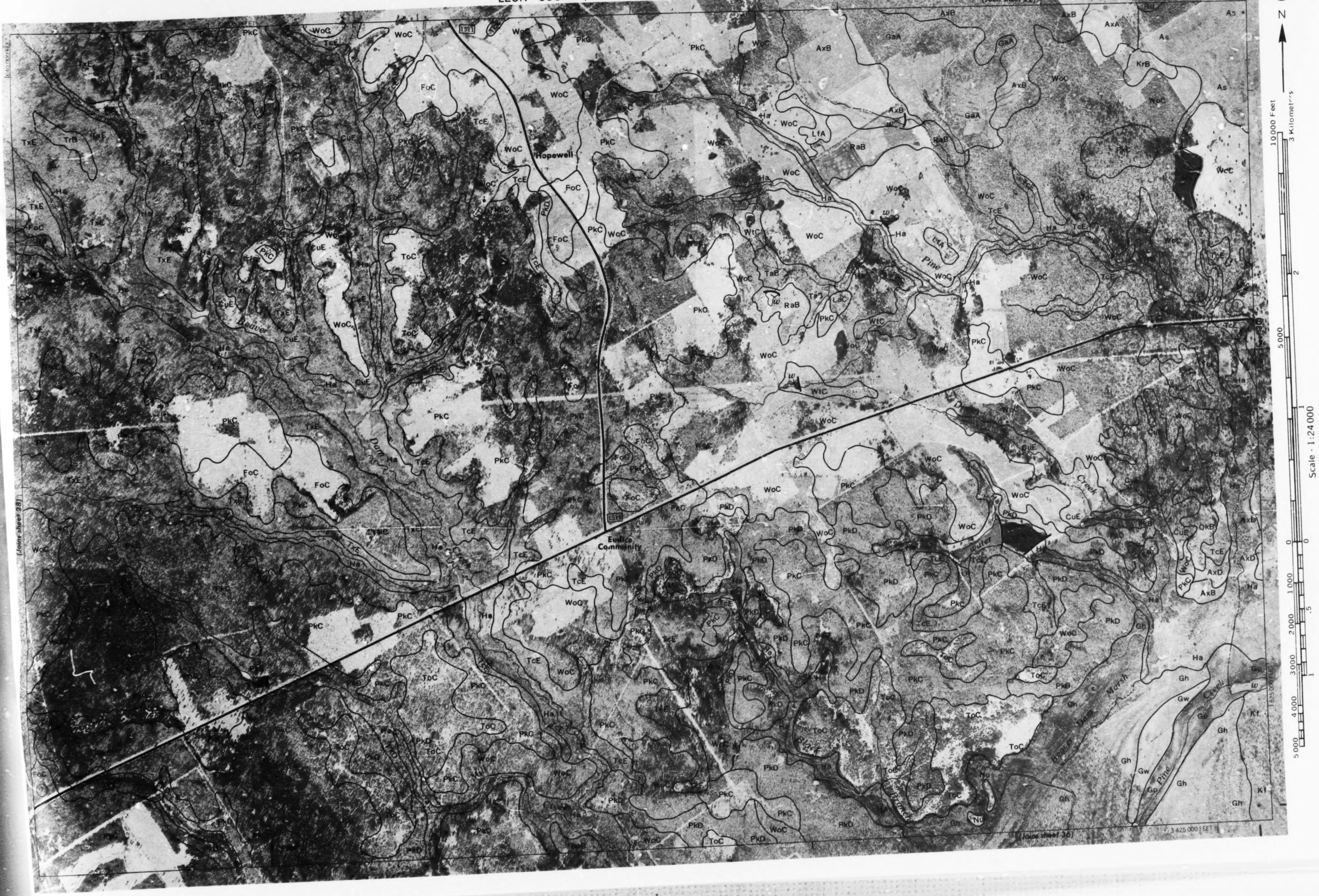
LEON COUNTY, TEXAS — SHEET NUMBER 27


27
N
(Joins sheet 20)
(Joins sheet 26)
(Joins sheet 34)
Scale - 1:24000
10000 Feet
5000
1000
2000
3000
4000
5000
0
3 Kilometers
2
1
.5
Keechi
Lower Keechi
Spring Branch
Tiger Branch
water
45
75
PkC
PkD
WoC
CuE
TcE
ToC
FoC
KrB
LaC
LfA
Ha
Na
SdB
HeE
RoC
Nu
BnB
AtB
AtD
RaB
OkB
Gw
TrB
TxE
Ms

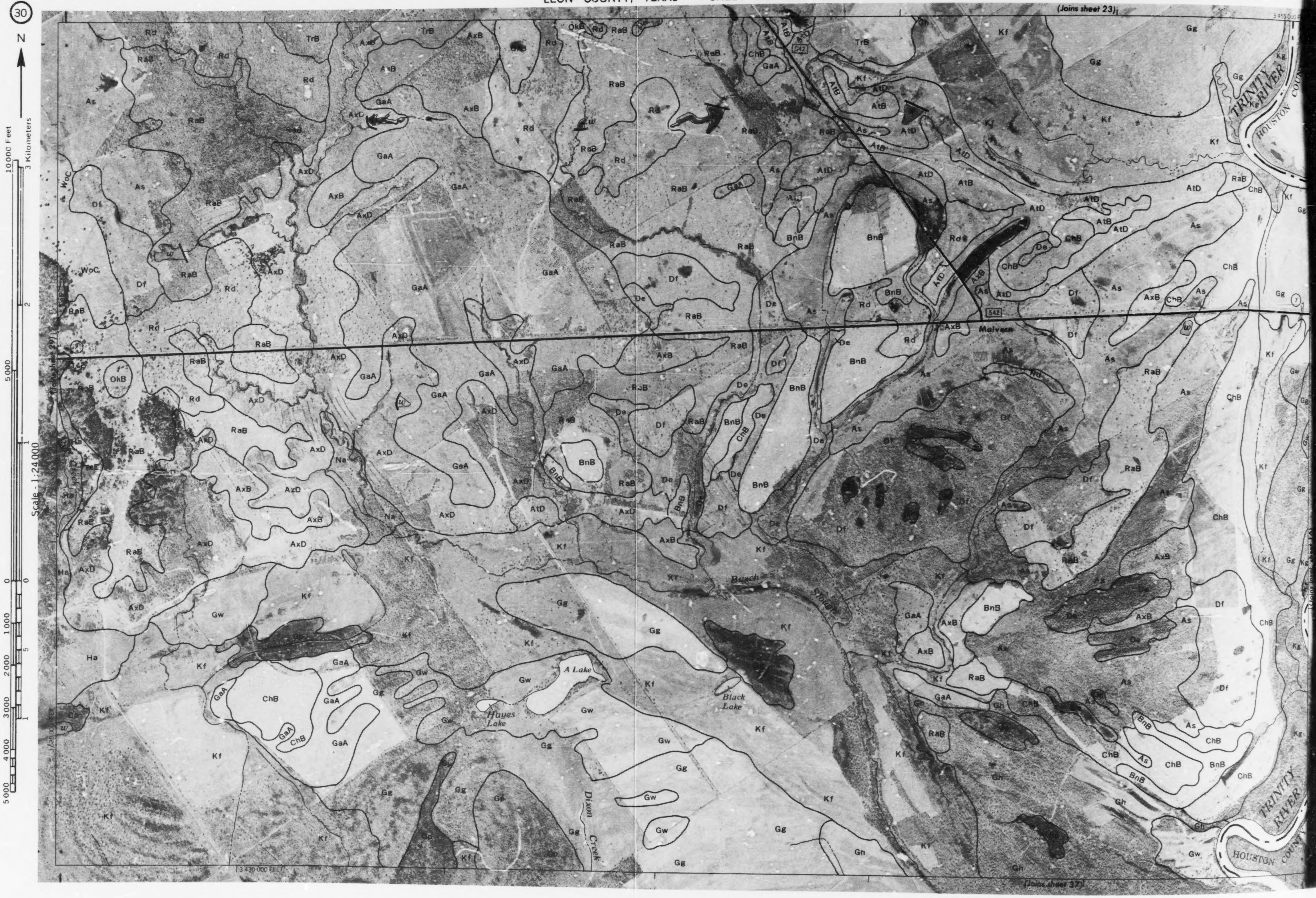
LEON COUNTY, TEXAS — SHEET NUMBER 28


28
N
10000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
0
.5
1
2
Scale - 1:24000
Pleasant Springs
water
Dam
Creek
PkC
PkD
WoC
FoC
CuE
TcE
TxE
Ha
KrB
ErC
TrB
RaB
LaC
CrE

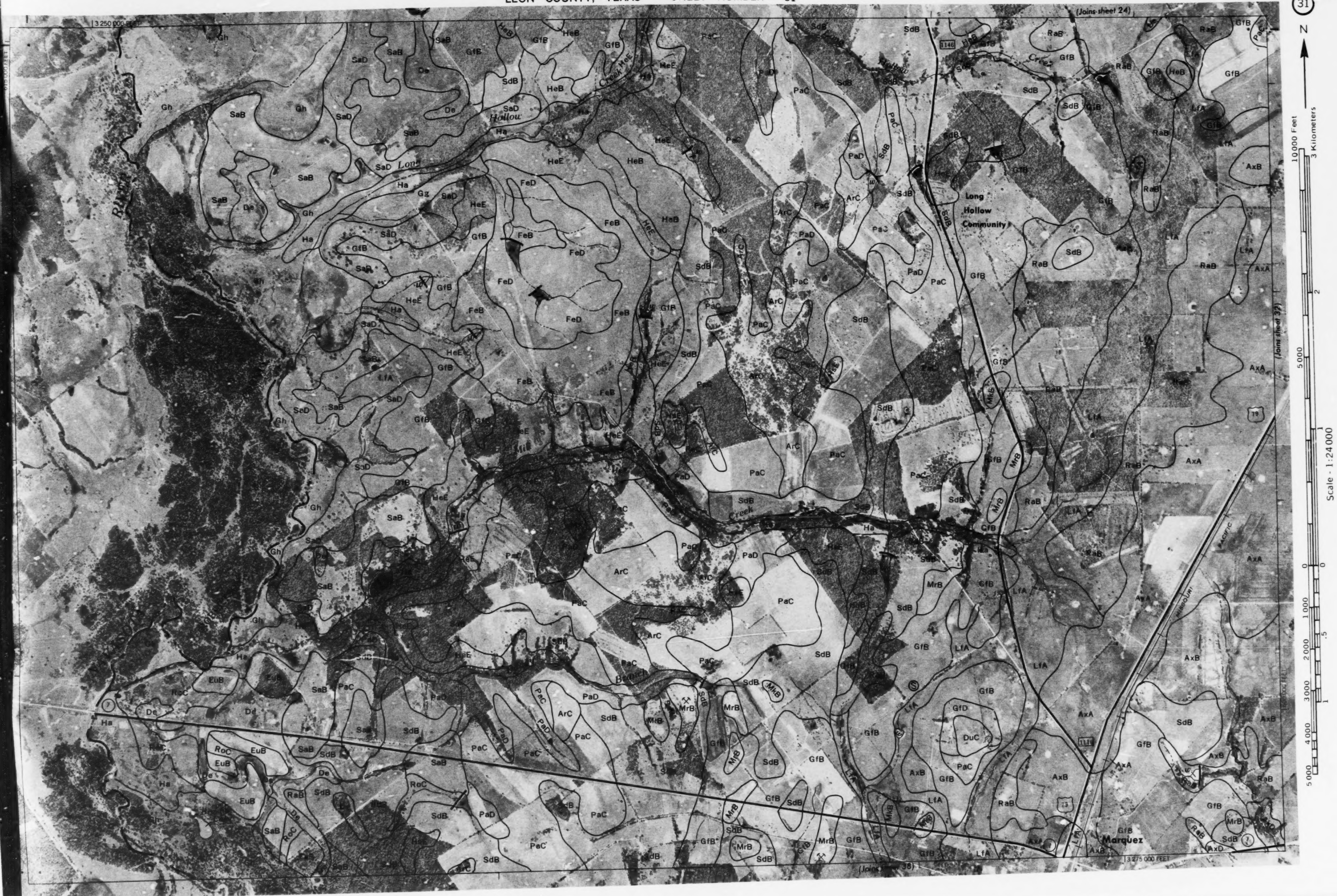
LEON COUNTY, TEXAS — SHEET NUMBER 29


(Joins sheet 22)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 36)
Hopewell
Eulice Community
1511
Pine Creek
Beaver
Dunn
Butler
Marsh
Pine Creek
1 625 000 FEET
3 425 000 FEET
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
5 000
0
1 000
2 000
3 000
4 000
5 000
2
1
.5
0
1

LEON COUNTY, TEXAS — SHEET NUMBER 30

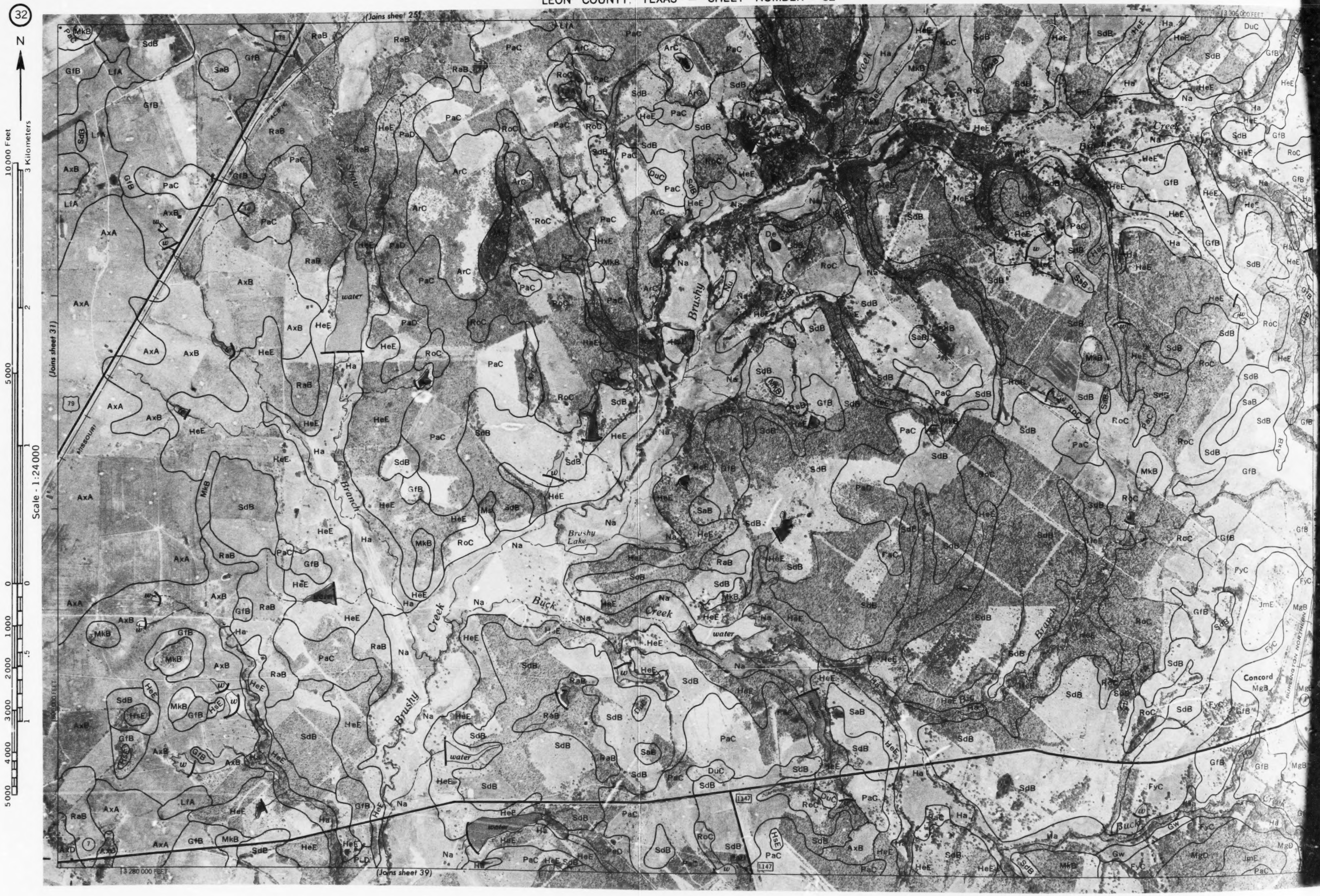

30
N
(Joins sheet 23)
(Joins sheet 37)
(Joins sheet 29)
10 000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
Scale - 1:24000
Malvern
542
TRINITY RIVER
HOUSTON COUNTY
Busch Slough
A Lake
Hayes Lake
Black Lake
Dixon Creek
3 430 000 FEET
3 450 000 FEET
As
AtB
AtD
AxB
AxD
BnB
ChB
De
Df
GaA
Gg
Gh
Gw
Ha
Kf
Kg
Na
OkB
RaB
Rd
TrB
WoC
w

LEON COUNTY, TEXAS — SHEET NUMBER 31

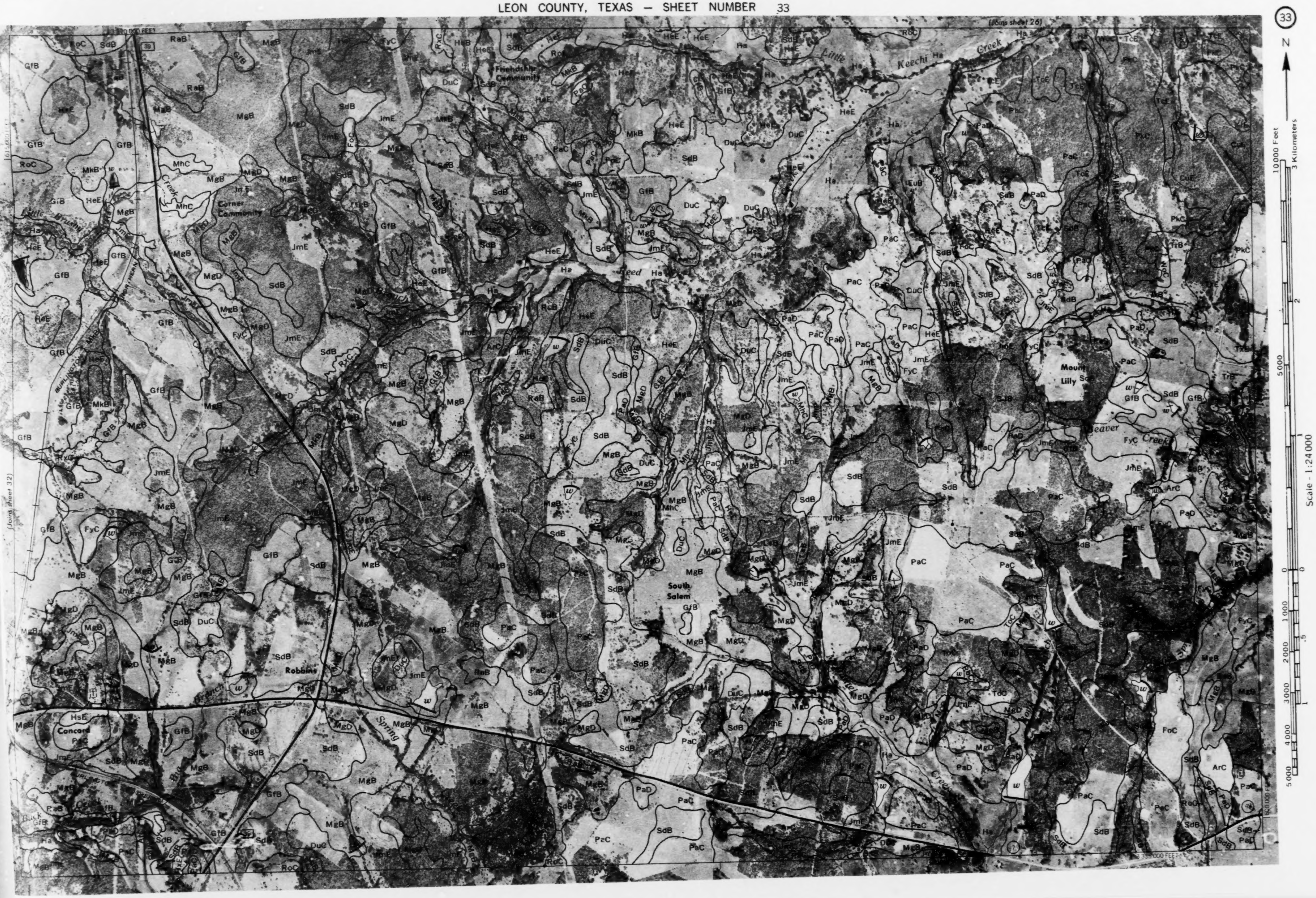


㉛
N
(Joins sheet 24)
(Joins sheet 32)
(Joins sheet 38)
3 250 000 FEET
3 275 000 FEET
Long Hollow Community
Long Hollow
Creek
Marquez
River
Branch
Missouri Pacific
1146
1119
7
79
Scale - 1:24 000
10 000 Feet
5000
1000
0
1000
2000
3000
4000
5000
3 Kilometers
2
1
.5
0
1
SaB
SaD
GfB
HeB
HeE
De
Gh
Ha
FeB
FeD
SdB
PaC
PaD
ArC
RaB
LfA
AxA
AxB
AxD
MrB
GfD
DuC
EuB
RoC

LEON COUNTY, TEXAS — SHEET NUMBER 32

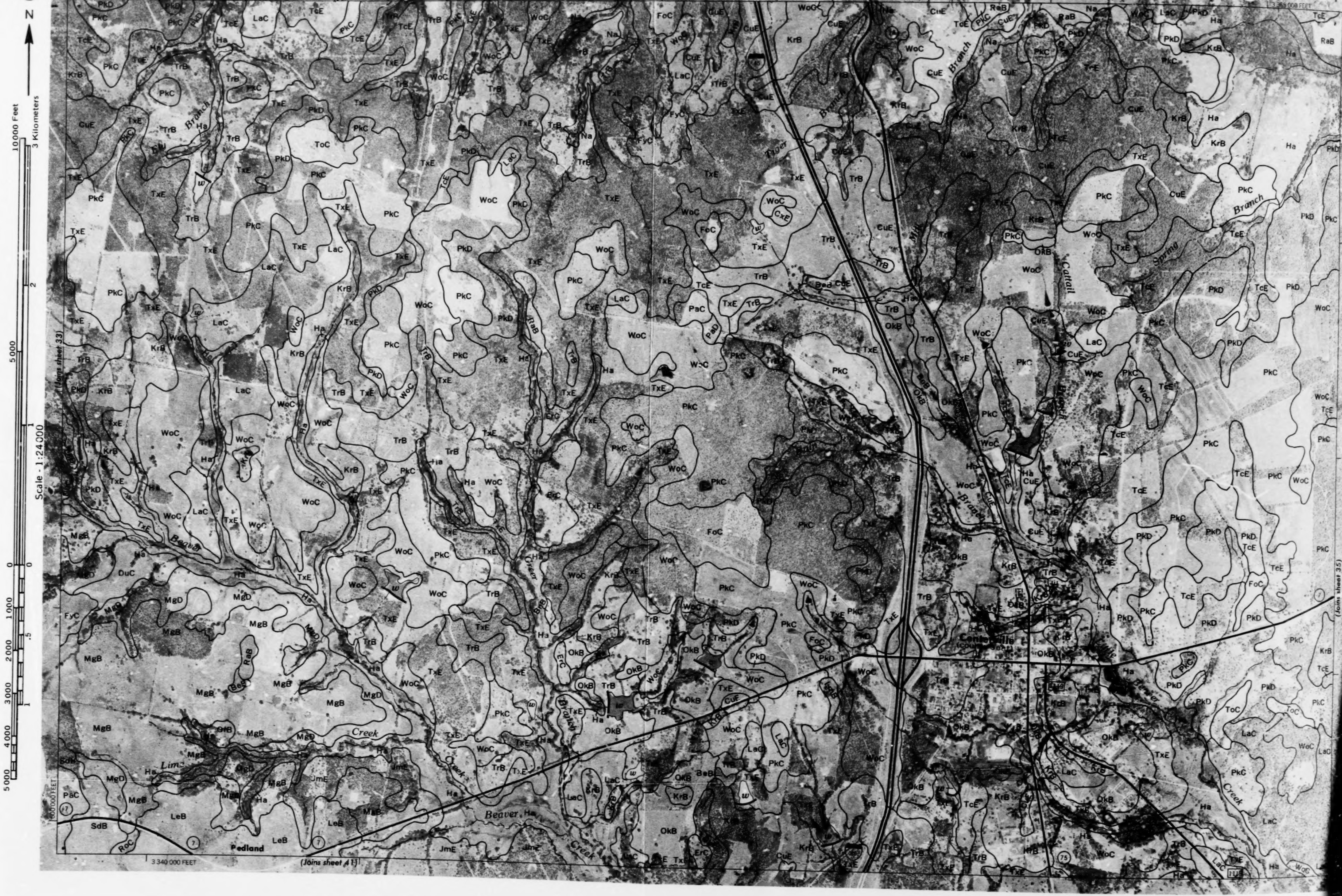

N
10 000 Feet
3 Kilometers
Scale - 1:24 000
(Joins sheet 25)
(Joins sheet 31)
(Joins sheet 39)
13 305 000 FEET
13 280 000 FEET
Brushy Creek
Buck Creek
Brushy Lake
Shaw Branch
Buck Branch
Concord
MISSOURI PACIFIC
BURLINGTON NORTHERN
water
79
1147

LEON COUNTY, TEXAS — SHEET NUMBER 33

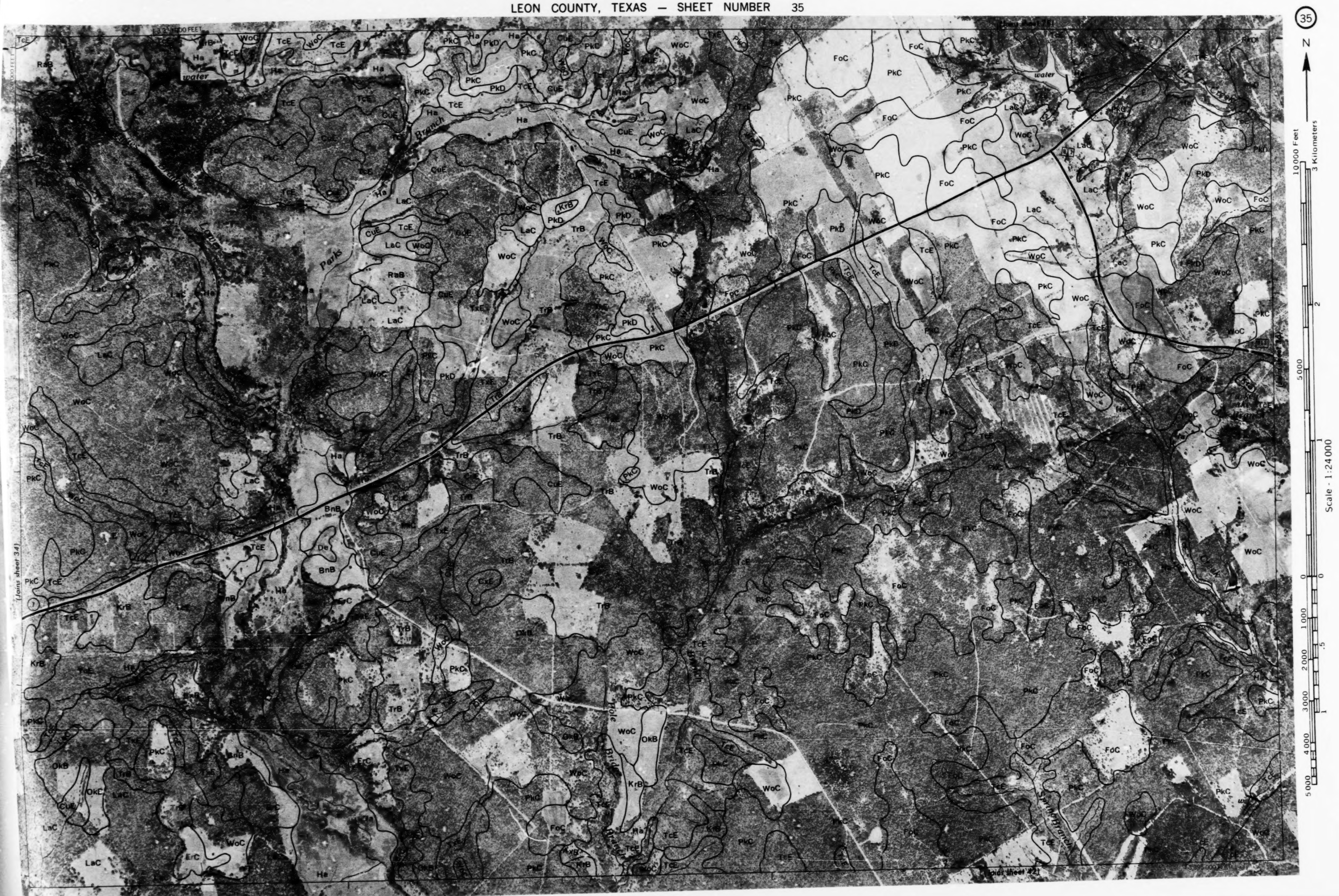

33
N
(Joins sheet 26)
(Joins sheet 32)
Friendship Community
Corner Community
Little Keechi Creek
Reed
Mount Lilly
Beaver Creek
South Salem
Robbins
Concord
Spring
Buck
Burlington
10 000 Feet
3 Kilometers
Scale - 1:24000
5 000
0
1 000
2000
3000
4000
5 000
2
1
.5
0

(34)

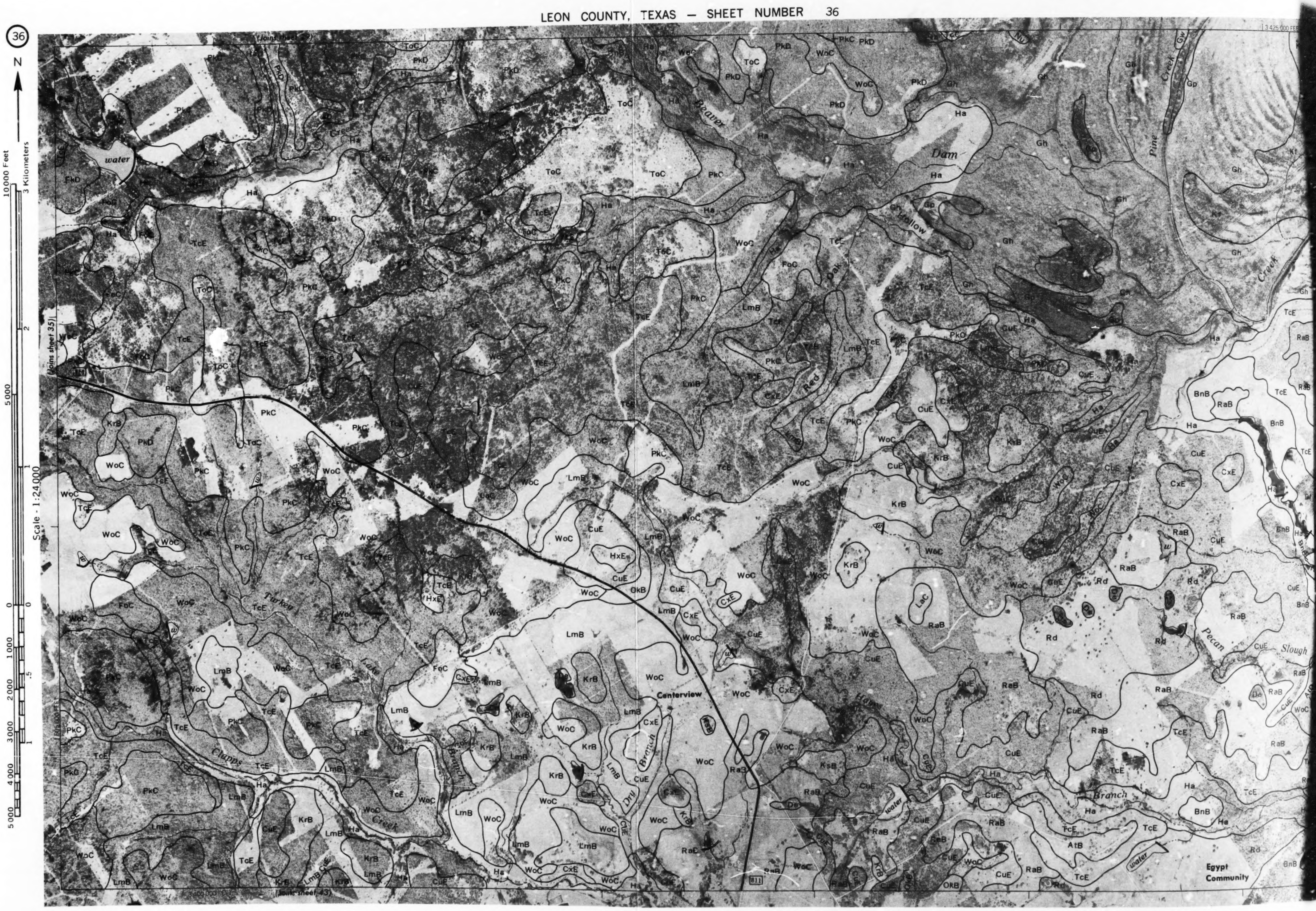
LEON COUNTY, TEXAS — SHEET NUMBER 34


N
10000 Feet
3 Kilometers
5000
2
1
Scale 1:24000
0
1000
.5
2000
3000
4000
5000
(Joins sheet 27)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 41)
3 340 000 FEET
Centerville
Pedland
Beaver Creek
Lime Creek
Tyner Branch
Mill Branch
Cattail Branch
Spring Branch
Branch
Creek
PkC
PkD
WoC
TxE
TrB
LaC
KrB
CuE
Ha
TcE
MgB
MgD
OkB
FoC
ToC
Na
RaB
LeB
SdB
JmE
DuC
FyC
ErC
PaC
BeB
CxE
w

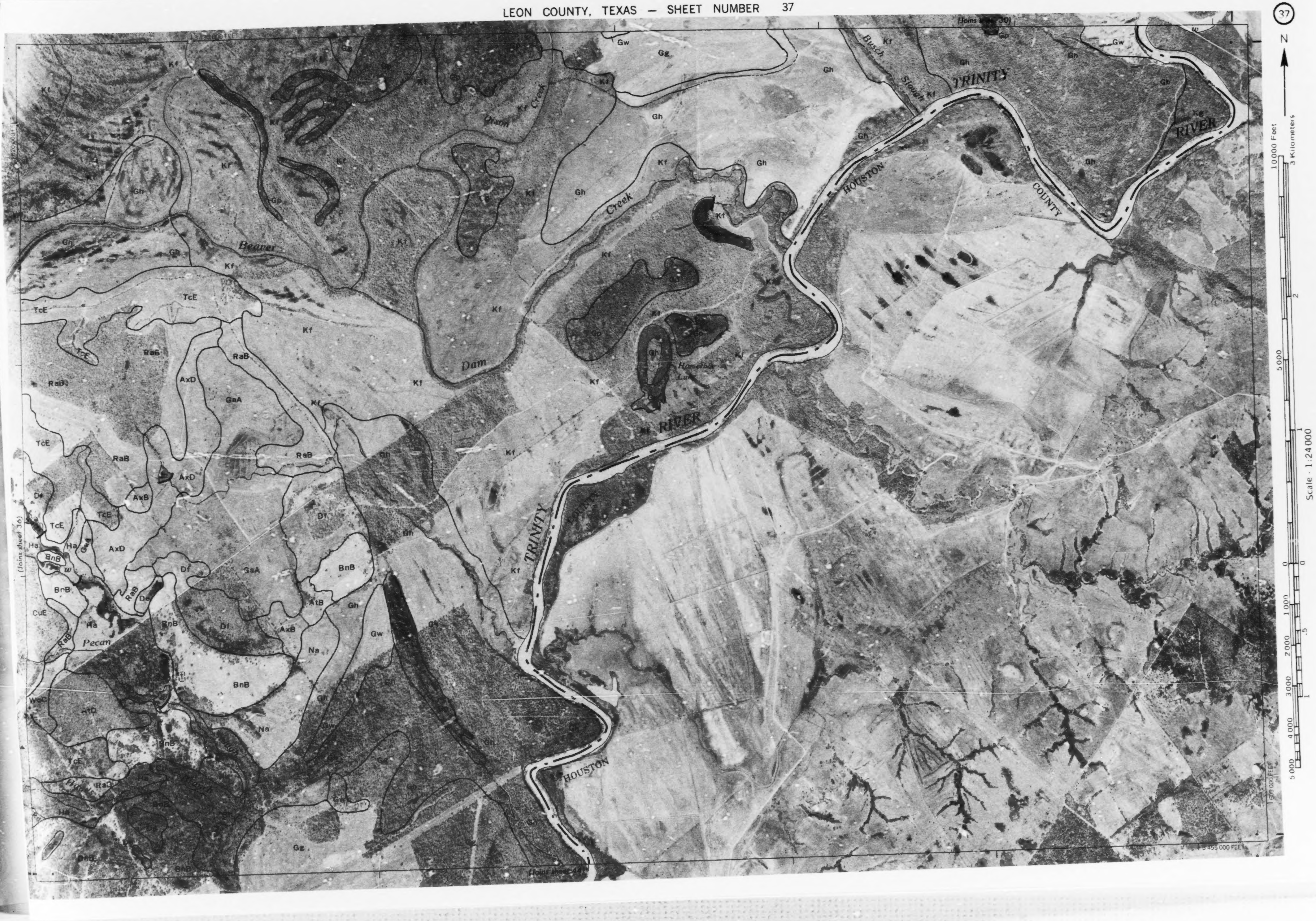
LEON COUNTY, TEXAS — SHEET NUMBER 35


35
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
5000
4000
3000
2000
1000
0
5000
(Joins sheet 34)
(Joins sheet 42)
Parks Branch
water
PkC
WoC
FoC
TcE
LaC
PkD
CuE
Ha
TrB
KrB
BnB
OkB

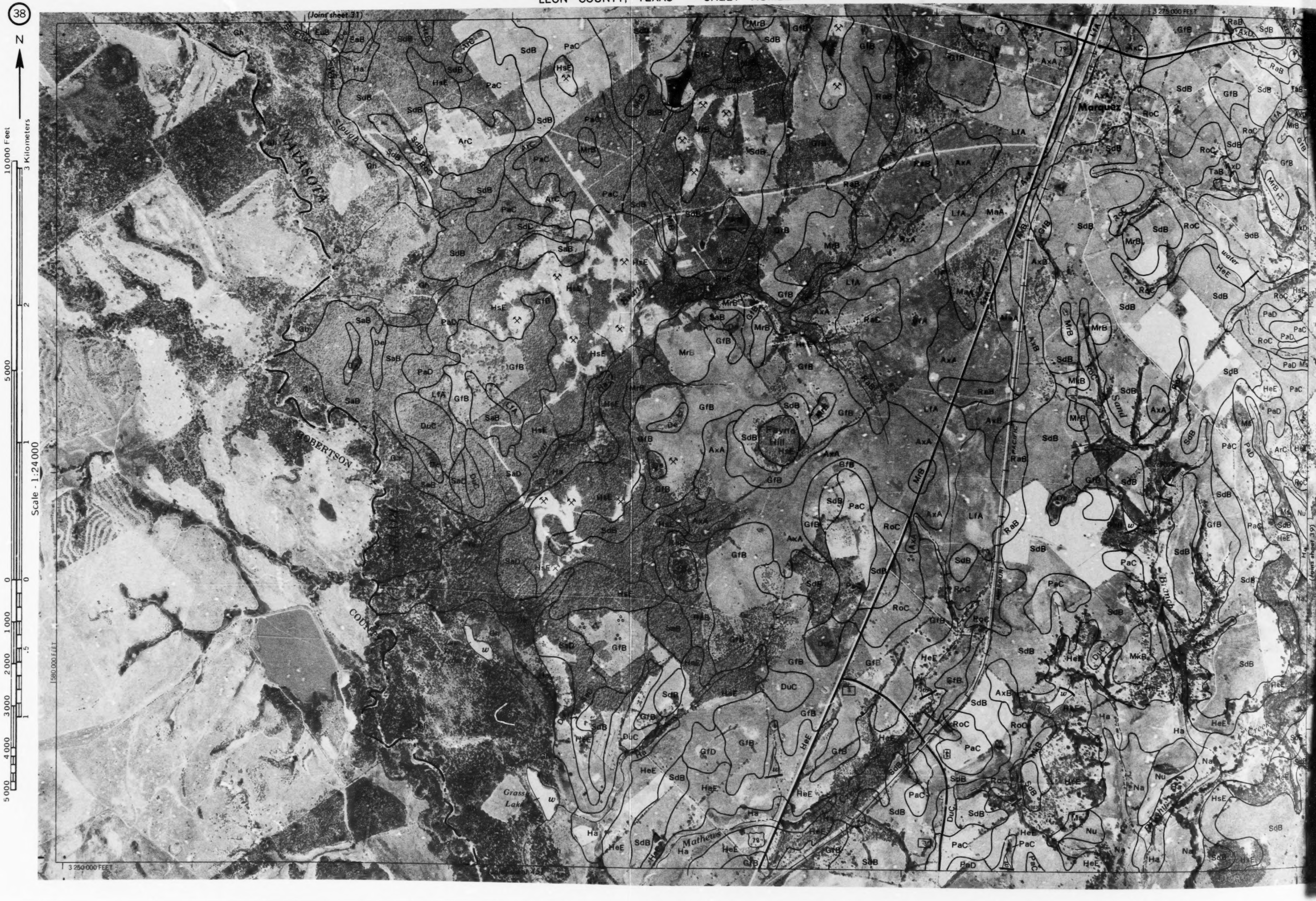
LEON COUNTY, TEXAS — SHEET NUMBER 36


36
N
10000 Feet
3 Kilometers
Scale - 1:24000
5 000
0
1000
2000
3000
4000
5 000
(Joins sheet 35)
(Joins sheet 43)
water
Beaver
Dam
Hollow
Oak
Red
Pine
Creek
Turkey
Lake
Clapps
Creek
Branch
Dry
Branch
Centerview
Pecan
Slough
Branch
water
Egypt
Community
PkC
PkD
ToC
TcE
Ha
WoC
LmB
KrB
CuE
CxE
HxE
FoC
RaB
Rd
BnB
Gh
Gp
Gw
LaC
AtB
De
OkB
811

LEON COUNTY, TEXAS — SHEET NUMBER 37

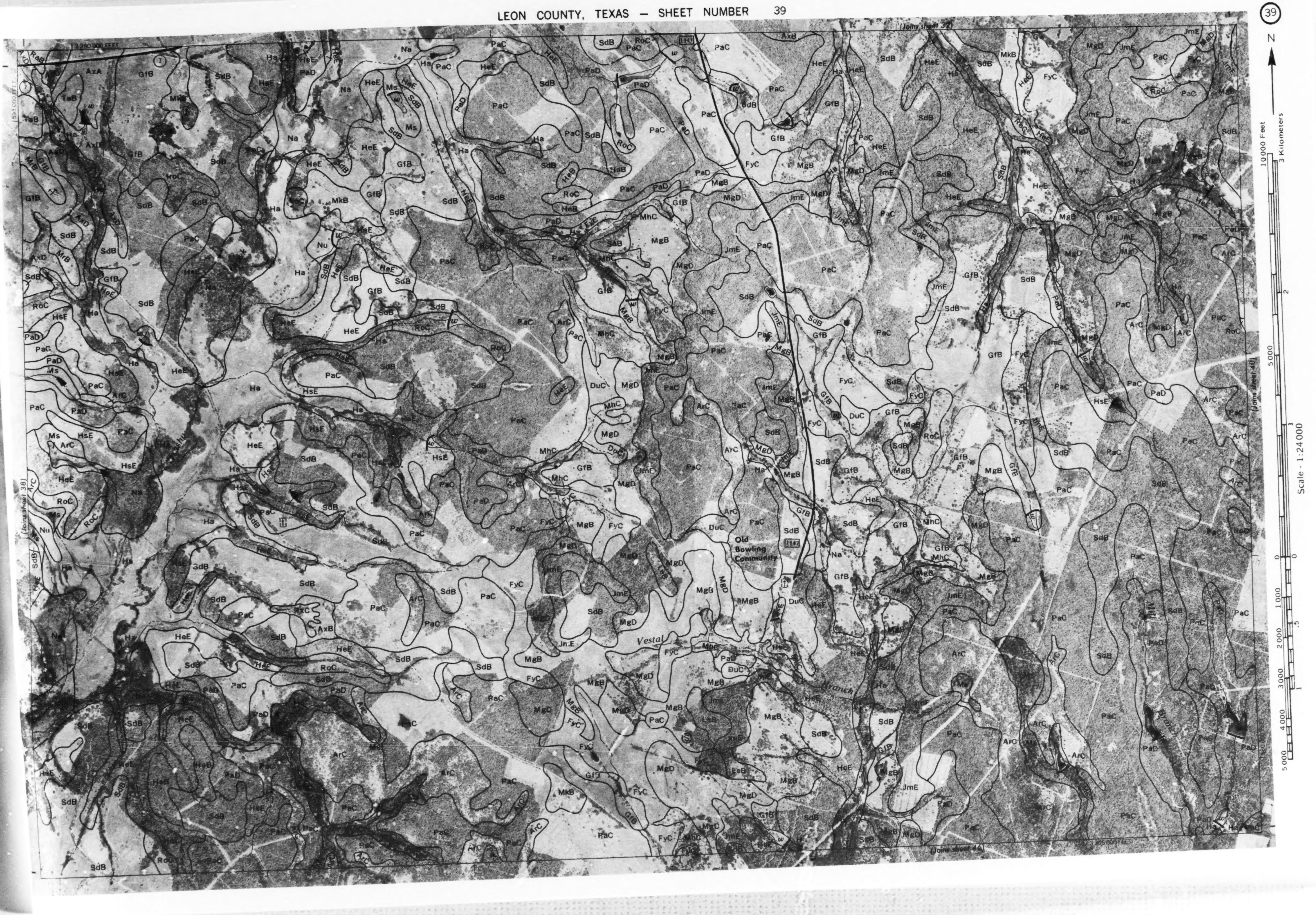

(Joins sheet 30)
(Joins sheet 36)
(Joins sheet 44)
TRINITY
RIVER
HOUSTON
COUNTY
Busch
Slough
Dam
Creek
Beaver
Pecan
Homestead
Lake
Kf
Gh
Gg
Gw
Gp
TcE
RaB
AxD
AxB
GaA
Df
BnB
AtB
AtD
Ha
CuE
Na
WsC
w
N
10 000 Feet
3 Kilometers
5 000
1 000
2 000
3 000
4 000
0
1
2
.5
Scale - 1:24 000
1 455 000 FEET

LEON COUNTY, TEXAS — SHEET NUMBER 38

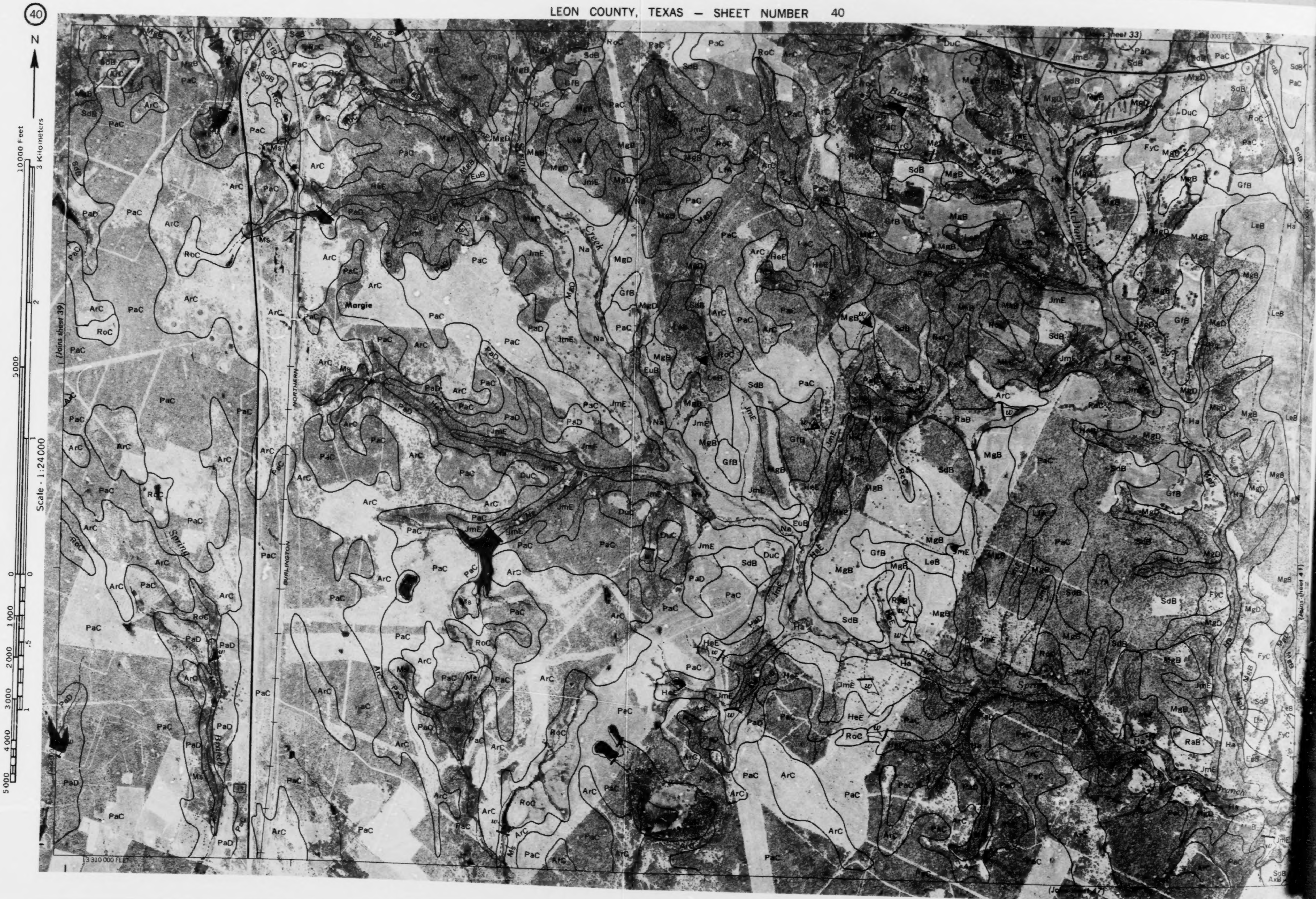


(38)
N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000
1000
2000
3000
4000
0
.5
1
2
3
(Joins sheet 31)
(Joins sheet 39)
3 275 000 FEET
580 000 FEET
3 250 000 FEET
NAVASOTA
ROBERTSON
COUNTY
Marquez
Grass Lake
Matthews
Sand
Branch
Pleasant Hill
water
w

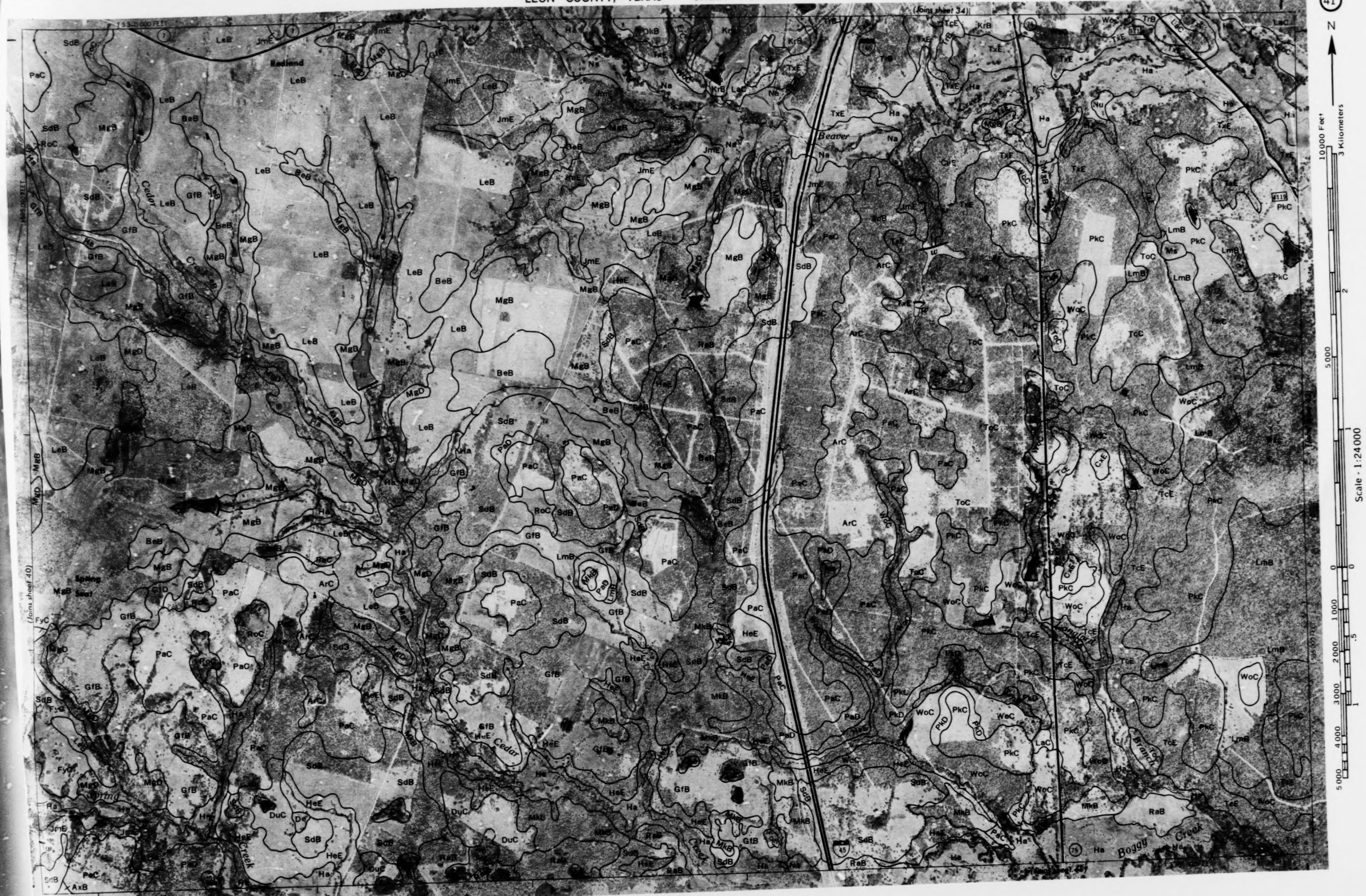
LEON COUNTY, TEXAS — SHEET NUMBER 39


(Joins sheet 32)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 46)
Old
Bowling
Community
Vestal
Branch
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
5 000
4 000
3 000
2 000
1 000
0
5000
1
2
.5
PaC
SdB
HeE
GfB
MgB
MgD
JmE
FyC
ArC
DuC
MhC
RoC
PaD
Ha
Na
HsE
MkB
AxB
AxA
Ms
Nu
TaB
w

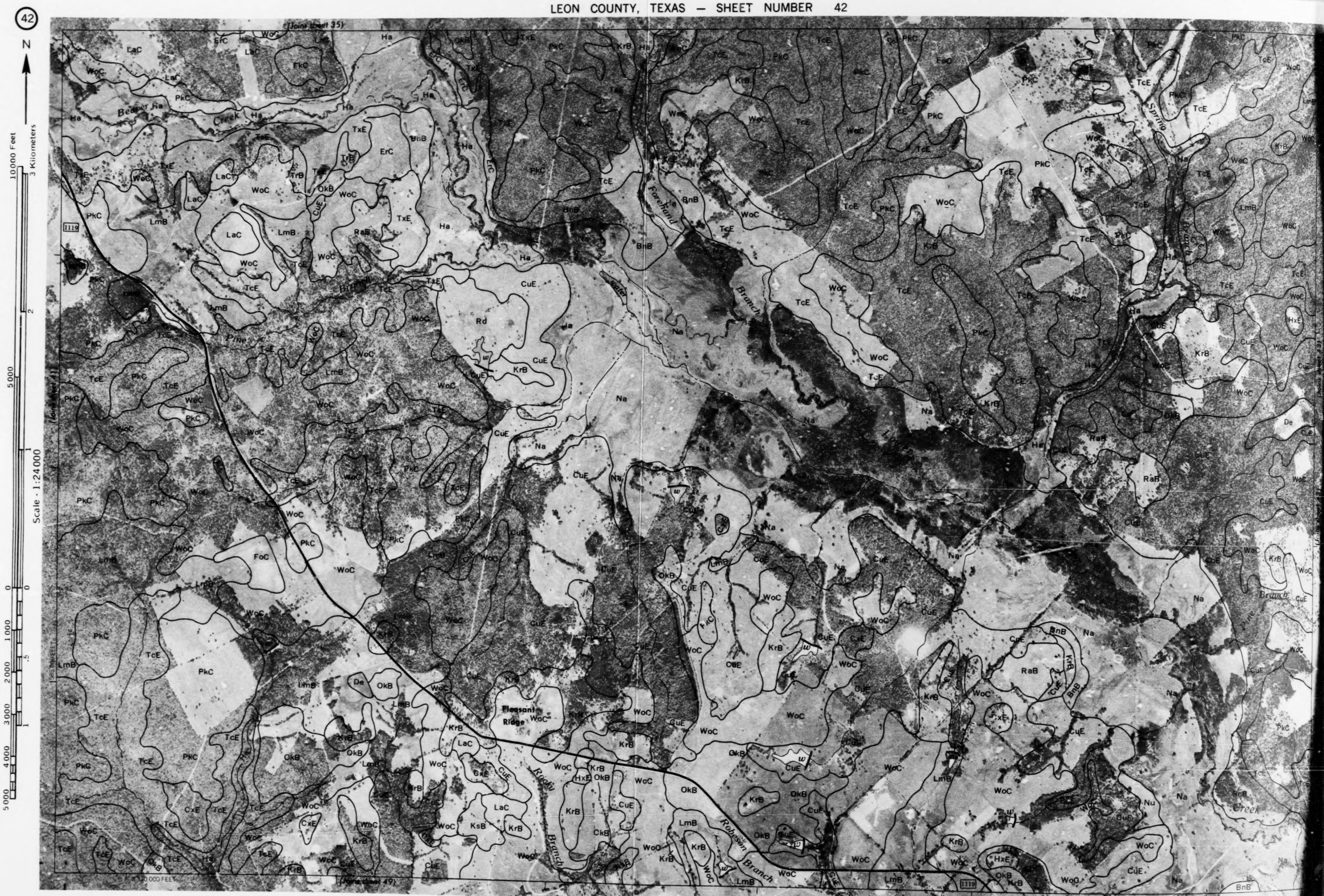
LEON COUNTY, TEXAS — SHEET NUMBER 40


N
10000 Feet
3 Kilometers
Scale 1:24000
5000
0
1000
2000
3000
4000
5000
(Joins sheet 39)
(Joins sheet 33)
(Joins sheet 41)
(Joins sheet 47)
Margie
NORTHERN
BURLINGTON
Creek
Spring
Branch
Buzzard
3 310 000 FEET
PaC
ArC
RoC
SdB
MgB
MgD
JmE
PaD
Ms
Na
HeE
GfB
LeB
DuC
EuB
Ha
FyC
RaB

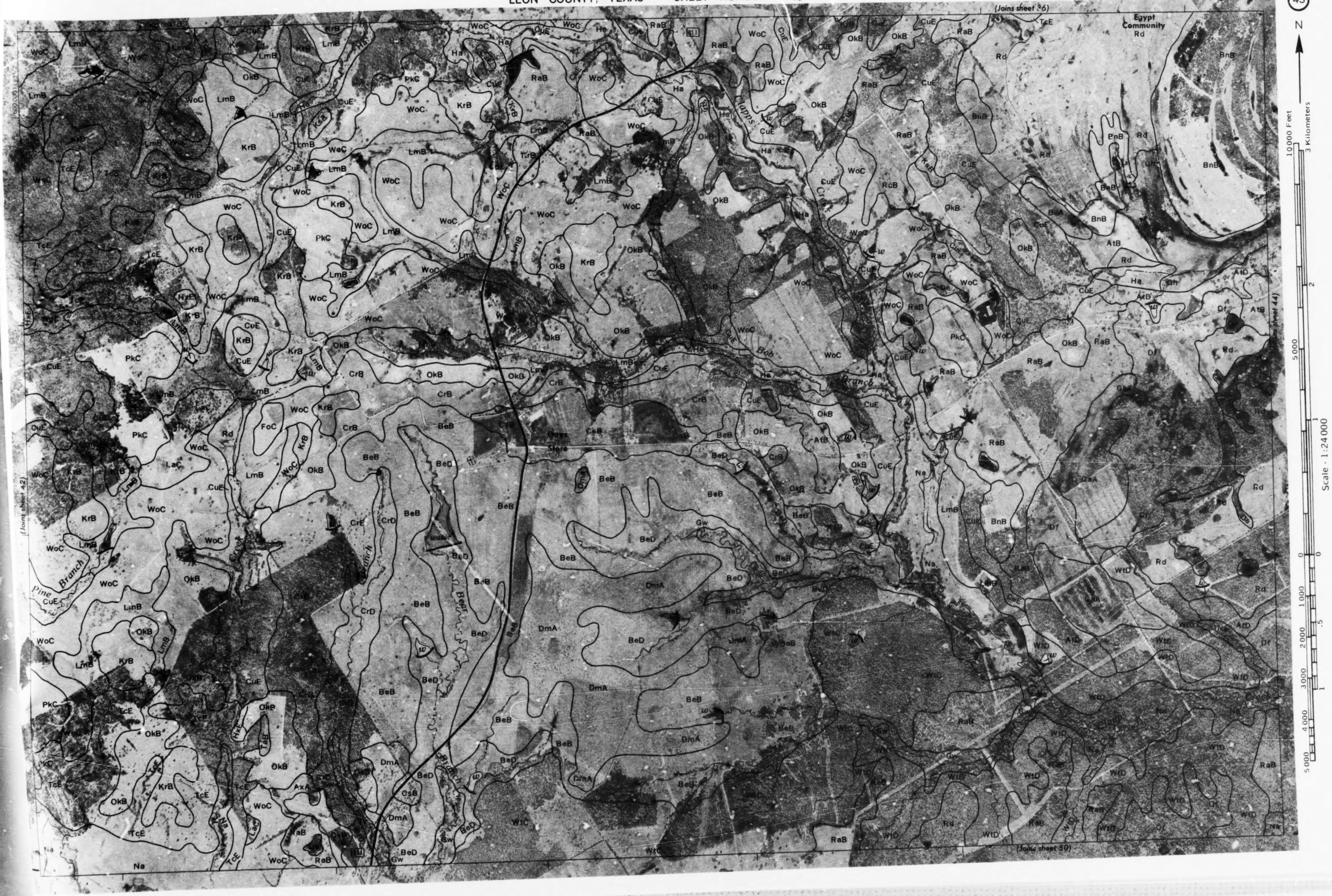
LEON COUNTY, TEXAS — SHEET NUMBER 41


(Joins sheet 34)
(Joins sheet 40)
Redland
Beaver
Cedar
Cedar Creek
Spring Seat
Spring Creek
Boggy Creek
Branch
N
10000 Feet
3 Kilometers
Scale 1:24000
5000
0
1000
2000
3000
4000
5000
SdB
LeB
PaC
MgB
GfB
BeB
JmE
HeE
Ha
Na
TxE
TcE
PkC
WoC
ToC
ArC
LmB
MkB
RaB
DuC
RoC
FyC
AxB
Ms
Nu
LaC
KrB
CrE

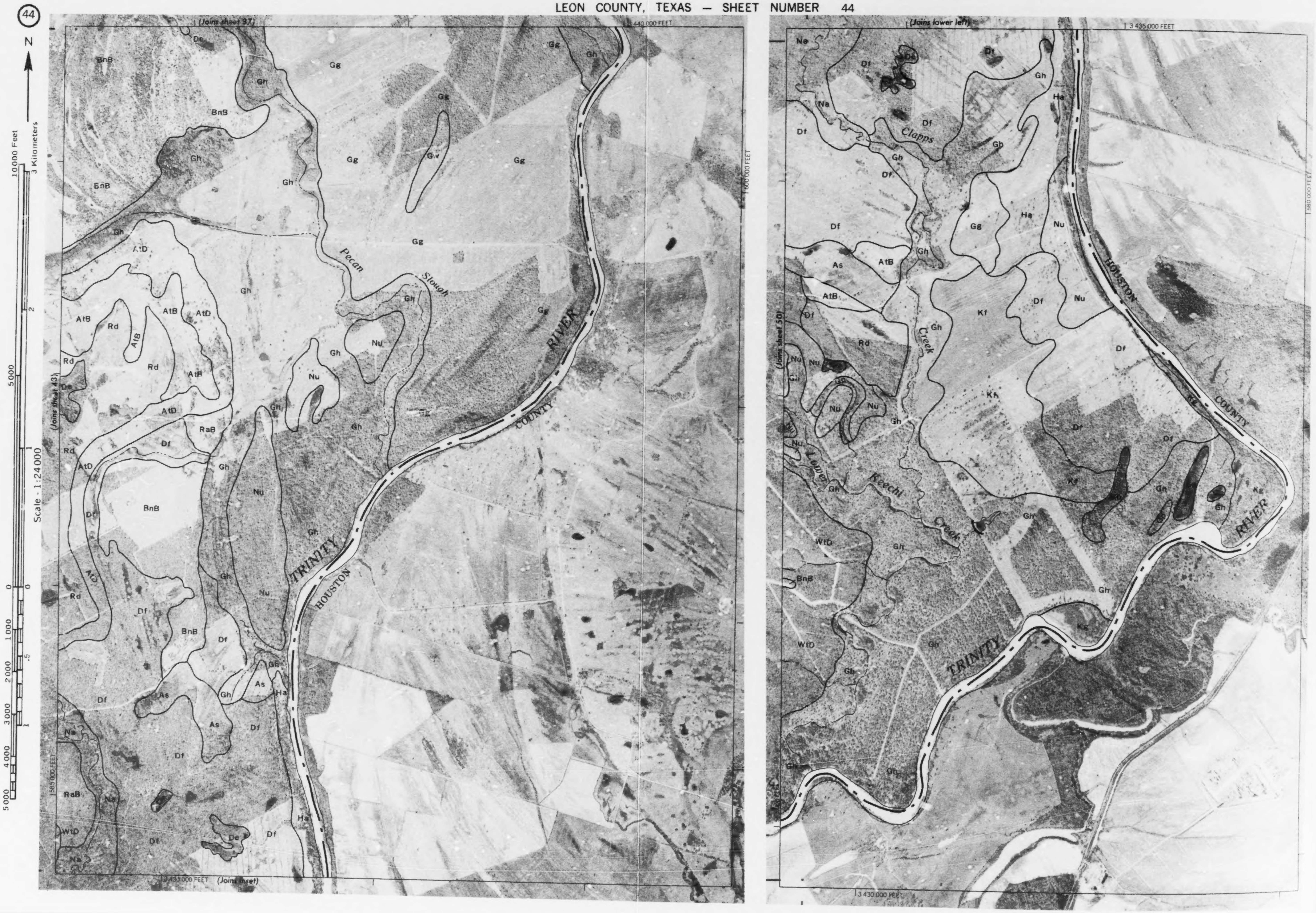
LEON COUNTY, TEXAS — SHEET NUMBER 42


N
10 000 Feet
3 Kilometers
5000
2
1
0
Scale - 1:24000
1000
2000
3000
4000
5000
.5
(Joins sheet 35)
(Joins sheet 49)
10 000 FEET
1119
Beaver Creek
Pine
Foxhound Branch
Spring
Pleasant Ridge
Rocky Branch
Robeson Branch
Branch
Creek
LaC
PkC
WoC
TcE
TxE
Ha
ErC
LmB
CuE
Rd
Na
KrB
BnB
OkB
RaB
FoC
De
HxE
CxE
KsB
Nu
w

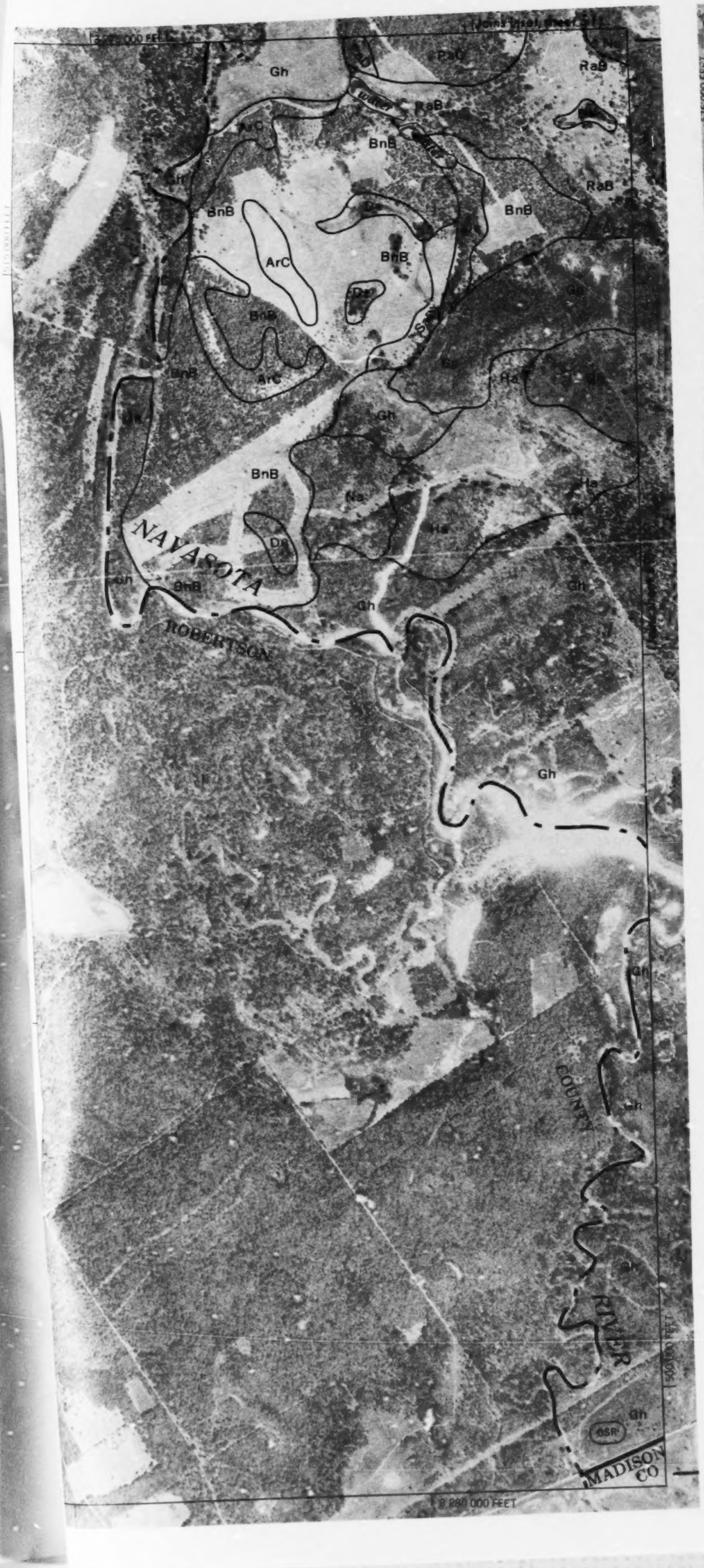
LEON COUNTY, TEXAS — SHEET NUMBER 43

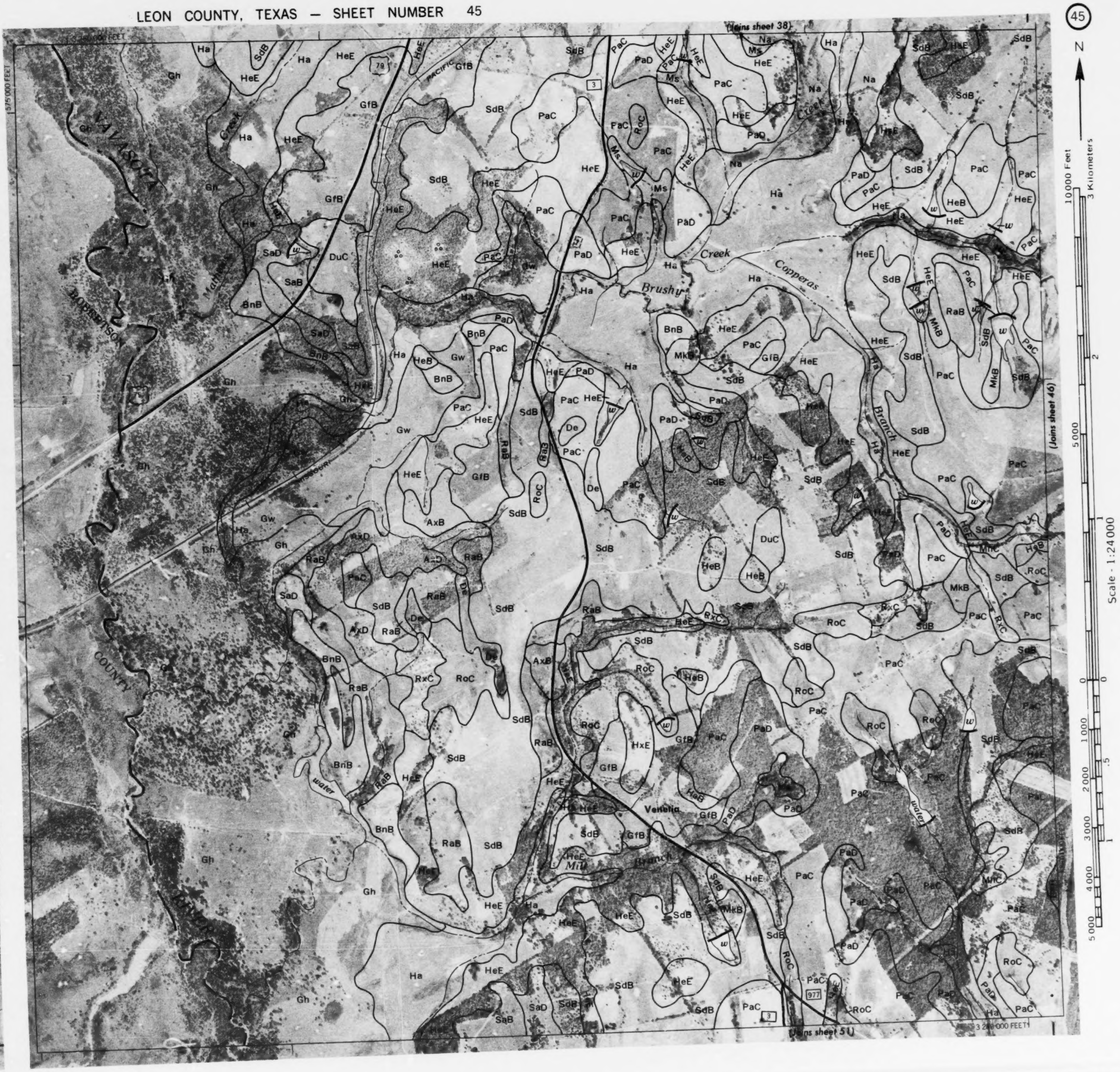

(Joins sheet 36)
(Joins sheet 42)
(Joins sheet 44)
(Joins sheet 50)
Egypt Community
Pine Branch
Clapps Creek
Bob Branch
Bear
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
5 000
0
1 000
2 000
3 000
4 000
5 000

LEON COUNTY, TEXAS — SHEET NUMBER 44

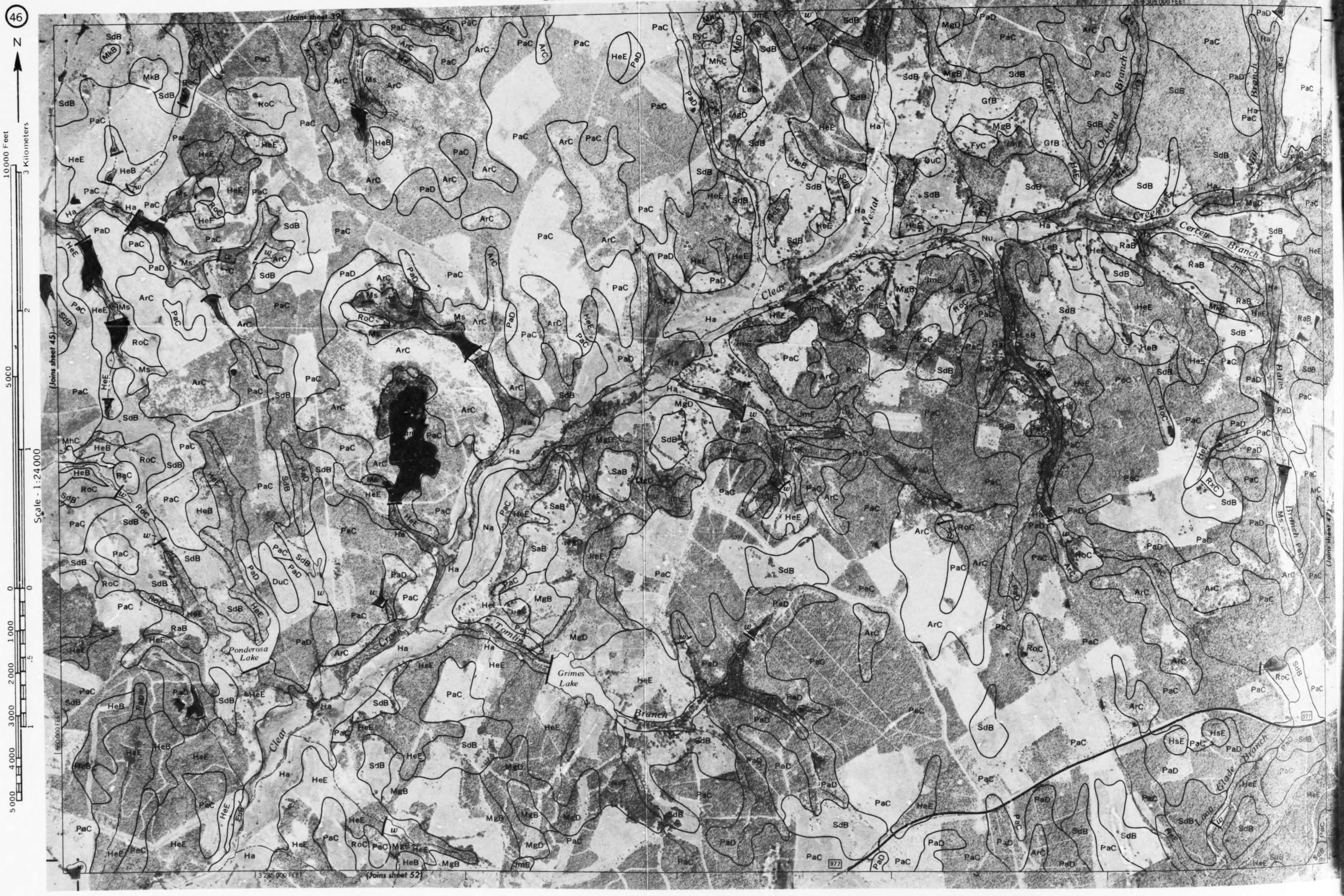

44
N
10 000 Feet
3 Kilometers
Scale - 1:24000
5 000
0
1000
2000
3000
4000
5 000
(Joins sheet 37)
(Joins sheet 43)
(Joins inset)
(Joins lower left)
(Joins sheet 50)
1 440 000 FEET
1 600 000 FEET
1 585 000 FEET
3 455 000 FEET
3 435 000 FEET
1 580 000 FEET
3 430 000 FEET
Pecan Slough
TRINITY RIVER
HOUSTON COUNTY
Clapps
Creek
Lower Keechi Creek
BnB
Gh
Gg
Gw
AtD
AtB
Rd
RaB
Df
Nu
As
Ha
De
Na
WtD
Kf
Ks
Ne

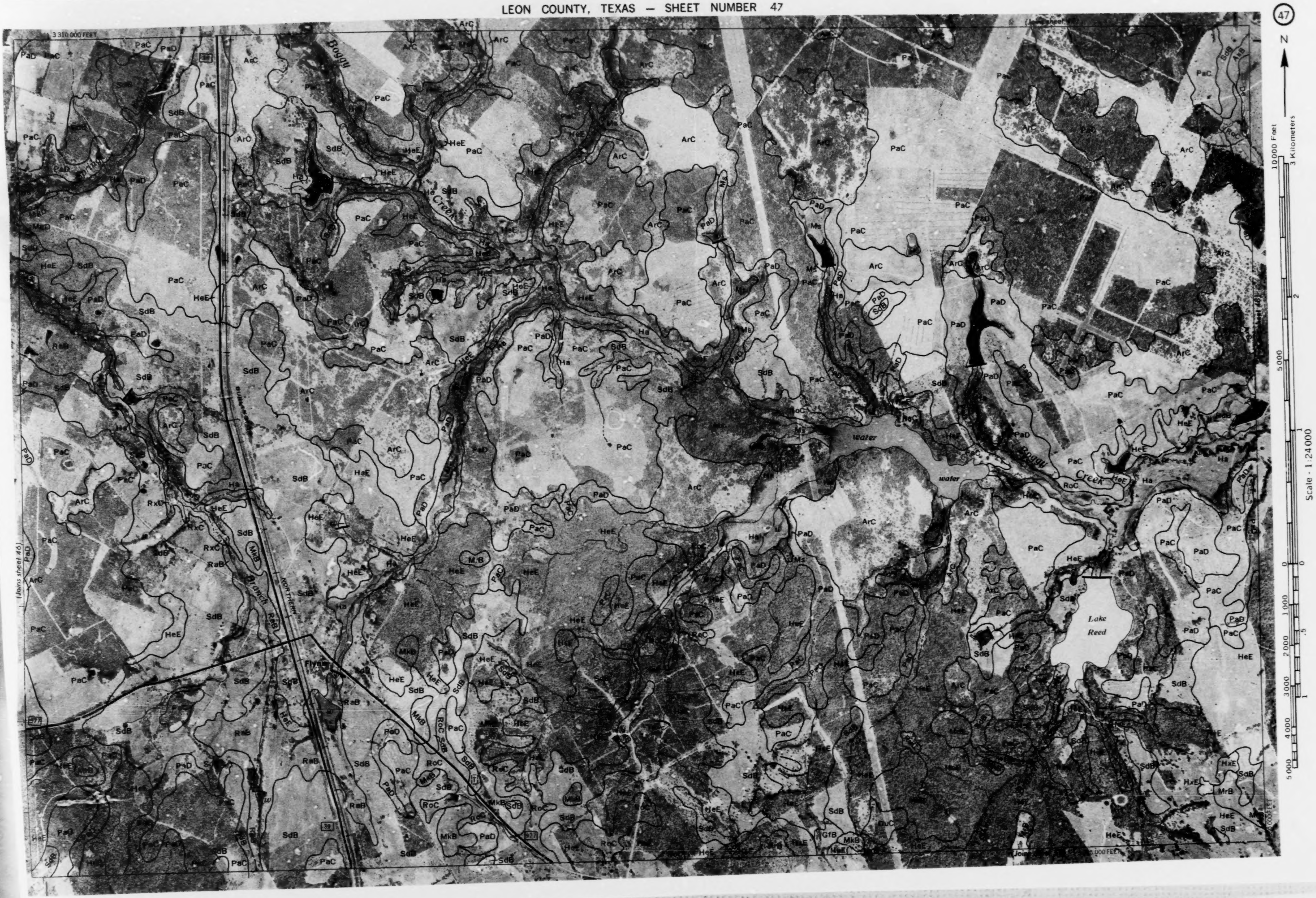
LEON COUNTY, TEXAS — SHEET NUMBER 45


NAVASOTA
ROBERTSON
COUNTY
RIVER
MADISON CO
Gh
BnB
ArC
RaB
Ha
HeE
SaB
68R
2 890 000 FEET


(45)
N
(Joins sheet 38)
(Joins sheet 46)
(Joins sheet 51)
375 000 FEET
3 200 000 FEET
NAVASOTA
ROBERTSON
COUNTY
RIVER
Mathews Creek
Brushy Creek
Copperas Creek
Branch
Mill Branch
Venetia
PACIFIC
MISSOURI
water
79
3
977
Gh
Ha
HeE
SdB
GfB
PaC
PaD
Na
Ms
RoC
RaB
BnB
Gw
SaD
SaB
DuC
De
AxB
AxD
RxC
MkB
HeB
HxE
w
Scale 1:24 000
5 000
4 000
3 000
2 000
1 000
0
5 000
10 000 Feet
1
.5
0
1
2
3 Kilometers

LEON COUNTY, TEXAS — SHEET NUMBER 46


46
N
Scale 1:24 000
10 000 Feet
3 Kilometers
5000
1
2
0
1000
2000
3000
4000
5000
(Joins sheet 39)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 52)
3 285 000 FEET
3 305 000 FEET
160 000 FEET
Ponderosa Lake
Grimes Lake
Clear Creek
Vestal
Tomlin Branch
Orchard Branch
Certee Branch
Bates Branch
Glade Branch
Branch
977
SdB
PaC
PaD
ArC
HeE
HeB
RoC
Ms
Ha
MgB
MgD
JmE
SaB
Na
Nu
DuC
FyC
GfB
MkB
MhC
RaB
HsE
LeB
EuB
w


3 310 000 FEET
N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000
0
1000
2000
3000
4000
5000
Boggy
Creek
Lake
Reed
water
Flynn
(Joins sheet 46)
PaC
PaD
SdB
HeE
ArC
Ha
RoC
RaB
MkB
Ms
HxE
MrB
GfB
RxC

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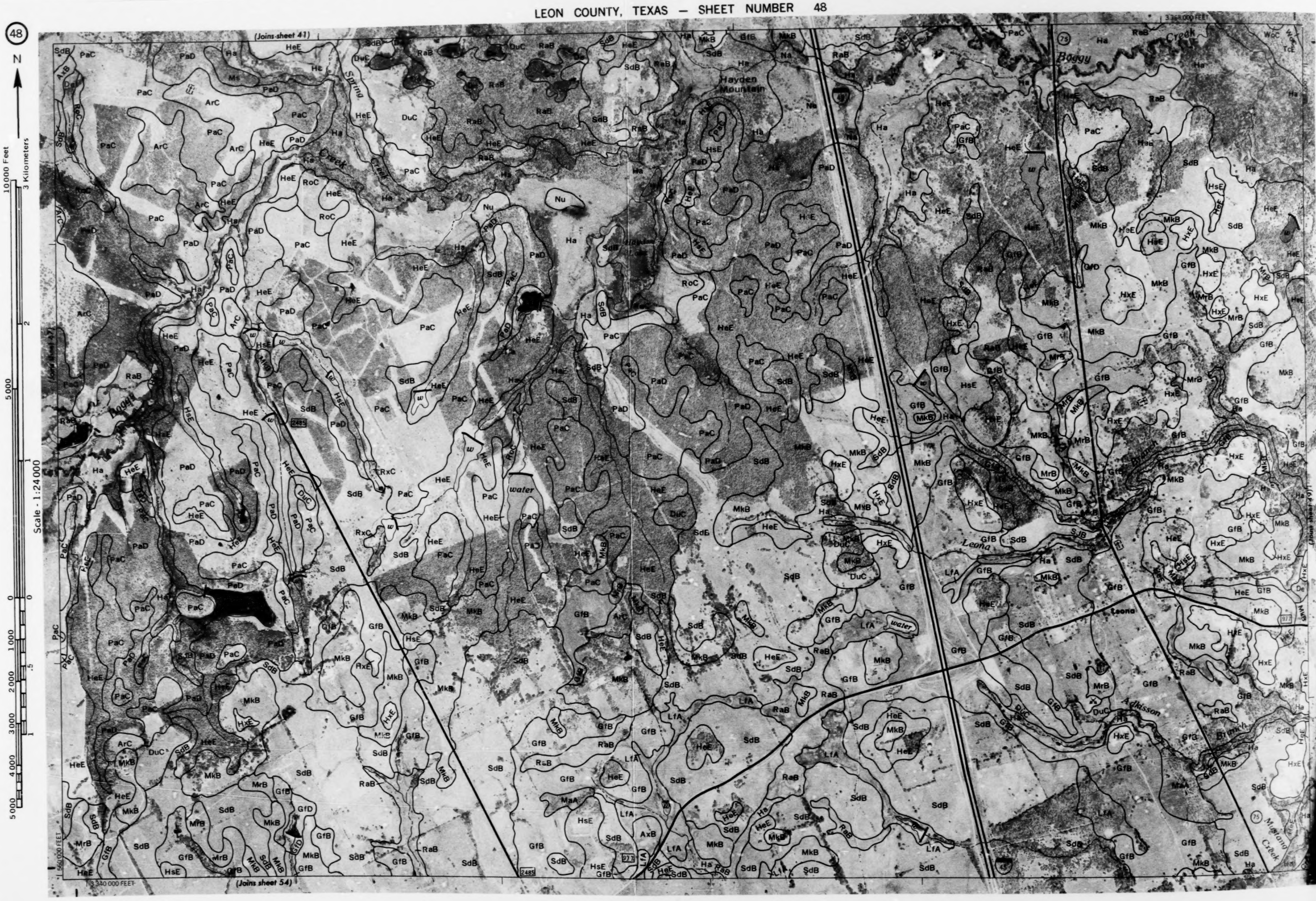
LEON COUNTY, TEXAS — SHEET NUMBER 48


48
N
10 000 Feet
3 Kilometers
Scale - 1:24000
(Joins sheet 41)
(Joins sheet 54)
Hayden Mountain
Boggy Creek
Spring Creek
Leona
Adkisson Branch
Mustang Creek
water
2485
75
977
3 360 000 FEET
560 000 FEET
340 000 FEET

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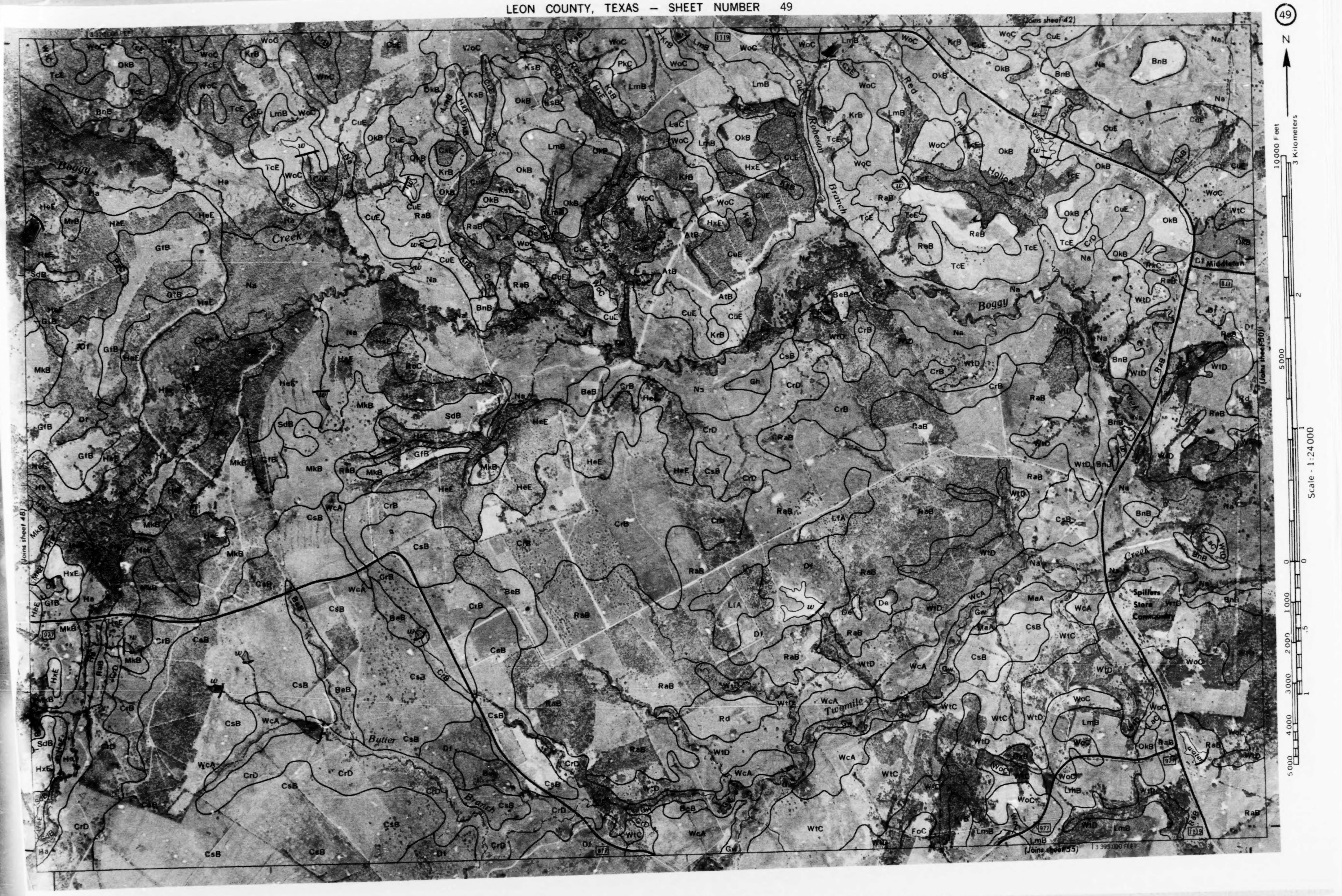
LEON COUNTY, TEXAS — SHEET NUMBER 49


(49)
(Joins sheet 42)
(Joins sheet 50)
(Joins sheet 48)
(Joins sheet 55)
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
Boggy Creek
Robeson Branch
Red
Holly
Twomile
Butler Branch
Middleton
Spillers Store Community
3 395 000 FEET

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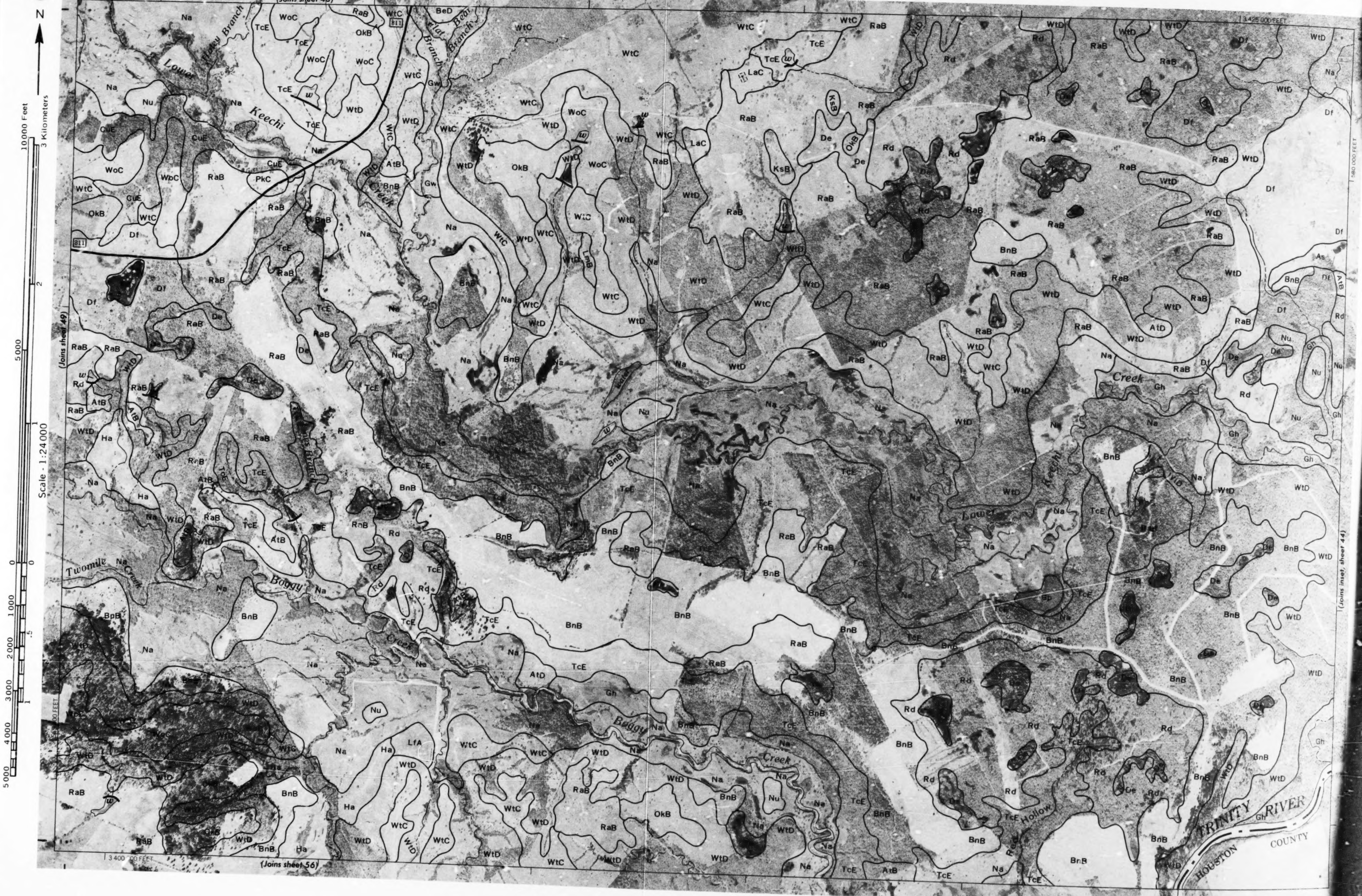
LEON COUNTY, TEXAS — SHEET NUMBER 50


N
10 000 Feet
3 Kilometers
Scale 1:24 000
5000
0
1000
2000
3000
4000
5000
(Joins sheet 43)
(Joins sheet 49)
(Joins sheet 56)
(Joins inset, sheet 44)
3 425 000 FEET
3 400 000 FEET
580 000 FEET
811
Lower Keechi
Honey Branch
Flat Branch
Bear Branch
Keechi Creek
Twomile Creek
Boggy Creek
Lower Keechi Creek
Hollow
TRINITY RIVER
HOUSTON COUNTY
Na
Nu
CuE
WoC
WtC
WtD
TcE
OkB
RaB
BeD
Gw
AtB
BnB
PkC
Df
De
Rd
RaB
LaC
KsB
OkB
Ha
Gh
AtD
LfA
As

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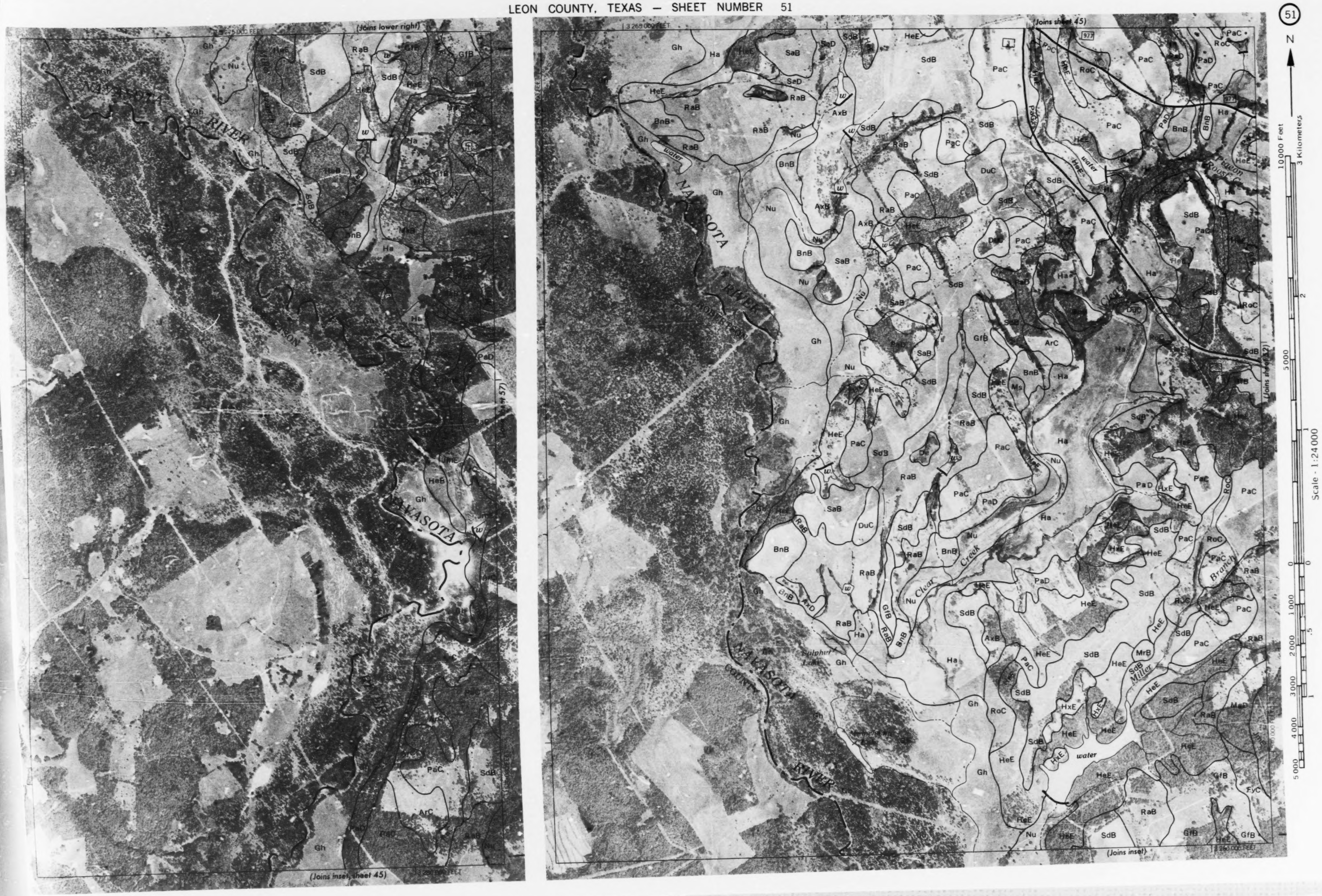
LEON COUNTY, TEXAS — SHEET NUMBER 51


(Joins lower right)
(Joins sheet 45)
NAVASOTA RIVER
NAVASOTA RIVER
NAVASOTA RIVER
Clear Creek
Pigeon Roost Cr.
Miller Branch
Sulphur Lake
water
(Joins sheet 57)
(Joins sheet 52)
(Joins inset, sheet 45)
(Joins inset)
Gh
Nu
HeE
SdB
RaB
GfB
Ha
BnB
PaC
PaD
ArC
SaB
AxB
DuC
RoC
HxE
MrB
FyC
w
977
N
10 000 Feet
3 Kilometers
Scale 1:24 000
0
1
2
3
5 000
1000
2000
3000
4000
5000

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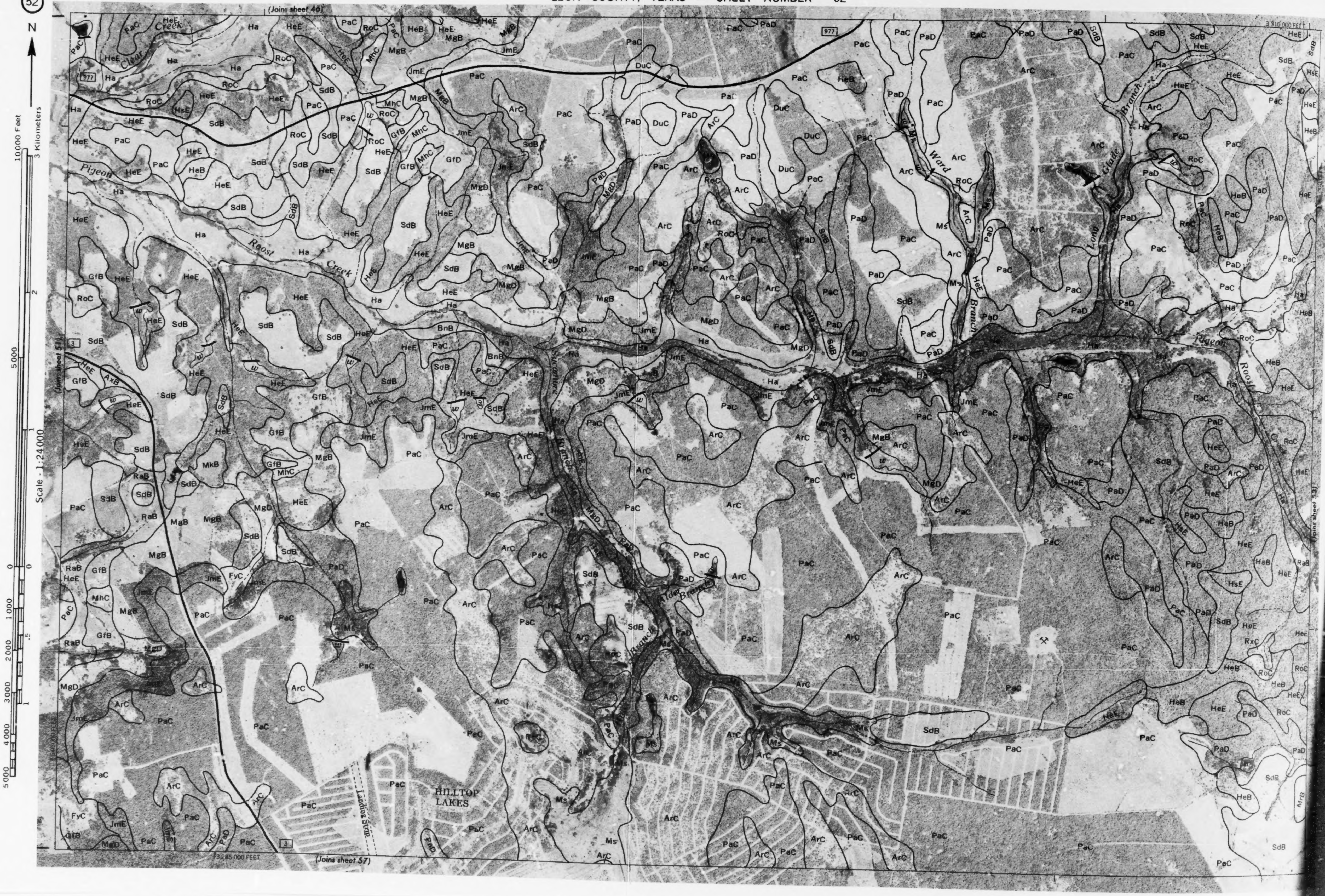
LEON COUNTY, TEXAS — SHEET NUMBER 52


(Joins sheet 46)
N
10 000 Feet
3 Kilometers
Scale - 1:24000
5000
0
1000
2000
3000
4000
5000
2
1
.5
0
1
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 57)
3 310 000 FEET
3 285 000 FEET
977
3
Clear Creek
Pigeon Roost Creek
Ward Branch
HeE Branch
Long Glade Branch
Sycamore Branch
Alder Branch
HILLTOP LAKES
Landing Strip
PaC
PaD
ArC
SdB
HeE
HeB
Ha
RoC
MgB
MgD
JmE
GfB
MhC
DuC
BnB
FyC
RaB
MkB
AxB
HsE
RxC
Ms
w

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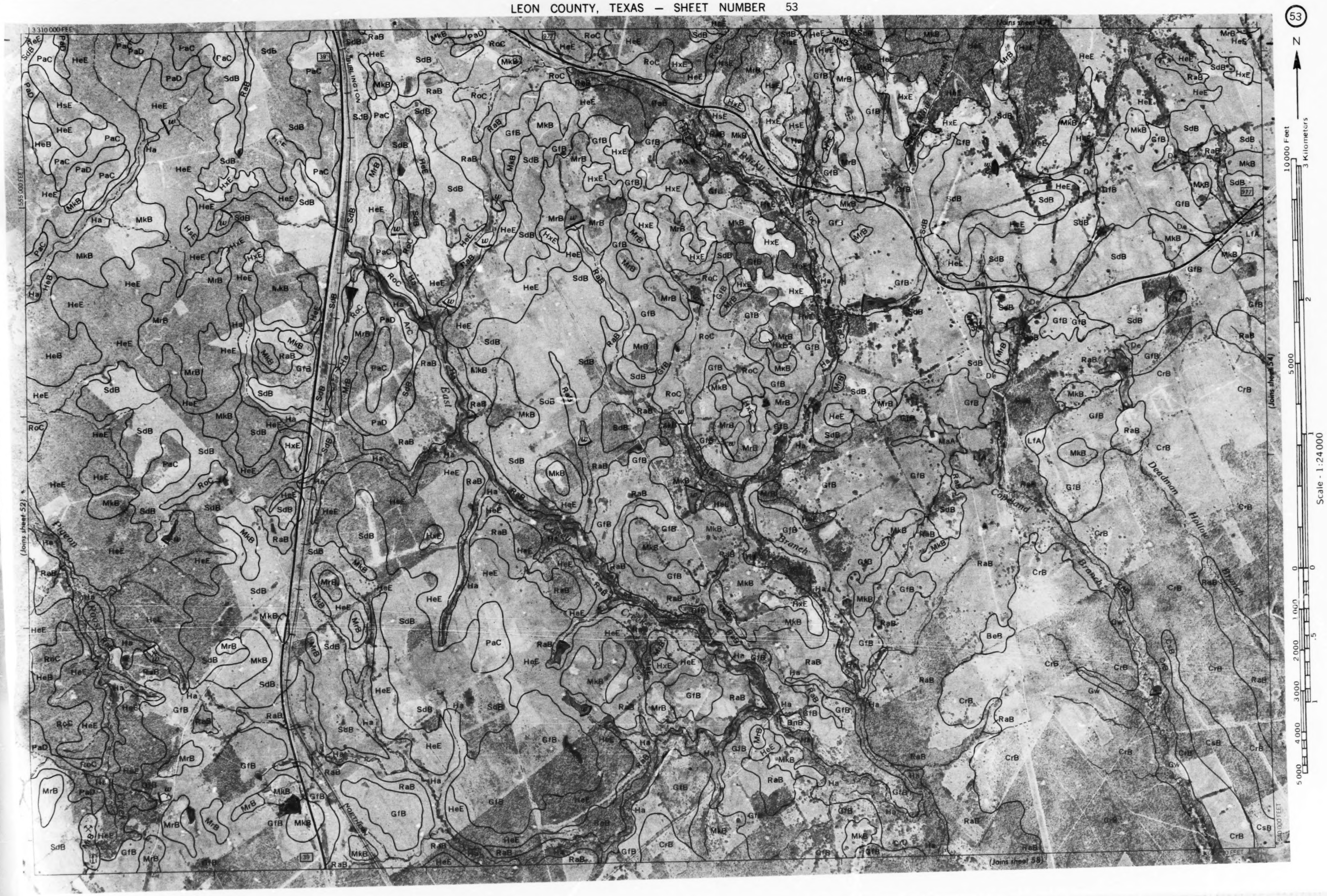
LEON COUNTY, TEXAS — SHEET NUMBER 53


53
N
3 310 000 FEET
1 555 000 FEET
(Joins sheet 47)
(Joins sheet 52)
(Joins sheet 54)
(Joins sheet 58)
10 000 Feet
3 Kilometers
Scale - 1:24 000
5000
0
1000
2000
3000
4000
5000
BURLINGTON
NORTHERN
39
977
East
Pigeon
Branch
Copeland
Deadman
Hollow
Branch
Creek
SdB
HeE
MkB
MrB
GfB
RaB
PaC
PaD
HxE
HsE
Ha
RoC
CrB
CsB
LfA
De
Gw
BeB
ArC
w

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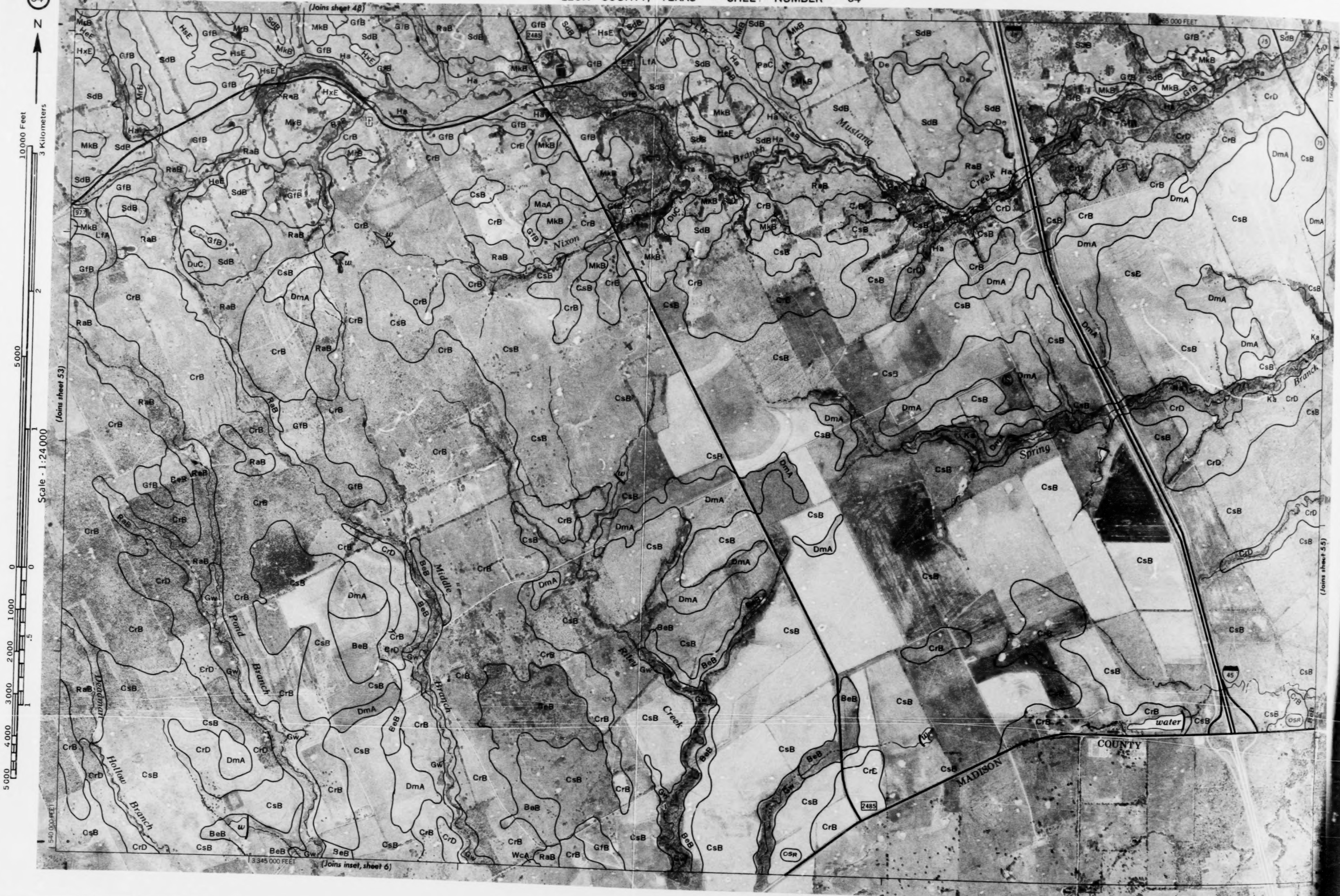
LEON COUNTY, TEXAS — SHEET NUMBER 54


N
(Joins sheet 48)
(Joins sheet 53)
(Joins sheet 55)
(Joins inset, sheet 6)
10 000 Feet
3 Kilometers
Scale 1:24 000
5000
4000
3000
2000
1000
0
.5
1
2
540 000 FEET
3 345 000 FEET
585 000 FEET
Mustang
Branch
Creek
Nixon
Spring
Branch
Middle
Branch
Pond
Branch
Doolittle
Hollow
Branch
Riley
Creek
MADISON
COUNTY
water
977
2485
75
45
OSR
CsB
CrB
DmA
SdB
GfB
MkB
RaB
Ha
HxE
HsE
BeB
Gw
CrD
Ka
DuC
MaA
LfA
PaC
De
WcA

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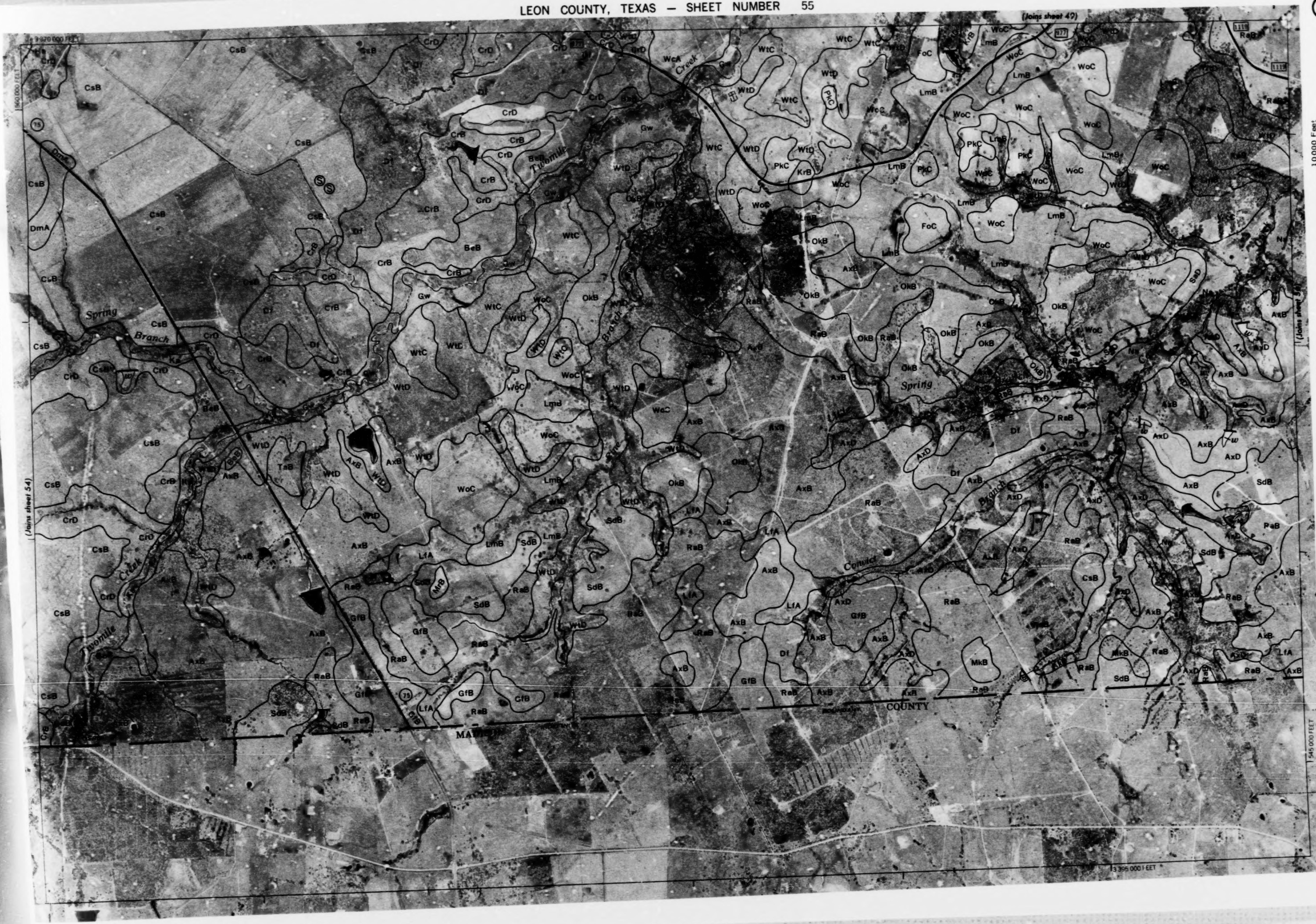
LEON COUNTY, TEXAS — SHEET NUMBER 55


(Joins sheet 49)
(Joins sheet 54)
(Joins sheet 56)
N
10 000 Feet
3 Kilometers
Scale - 1:24 000
Spring
Branch
Twomile
Creek
Spring
Branch
Creek
MADISON
COUNTY
CsB
CrD
CrB
Df
Gw
WtC
WtD
WoC
LmB
PkC
KrB
FoC
OkB
AxB
AxD
ReB
SdB
GfB
LfA
MkB
PaB
DmA
BeB
TaB
SaD

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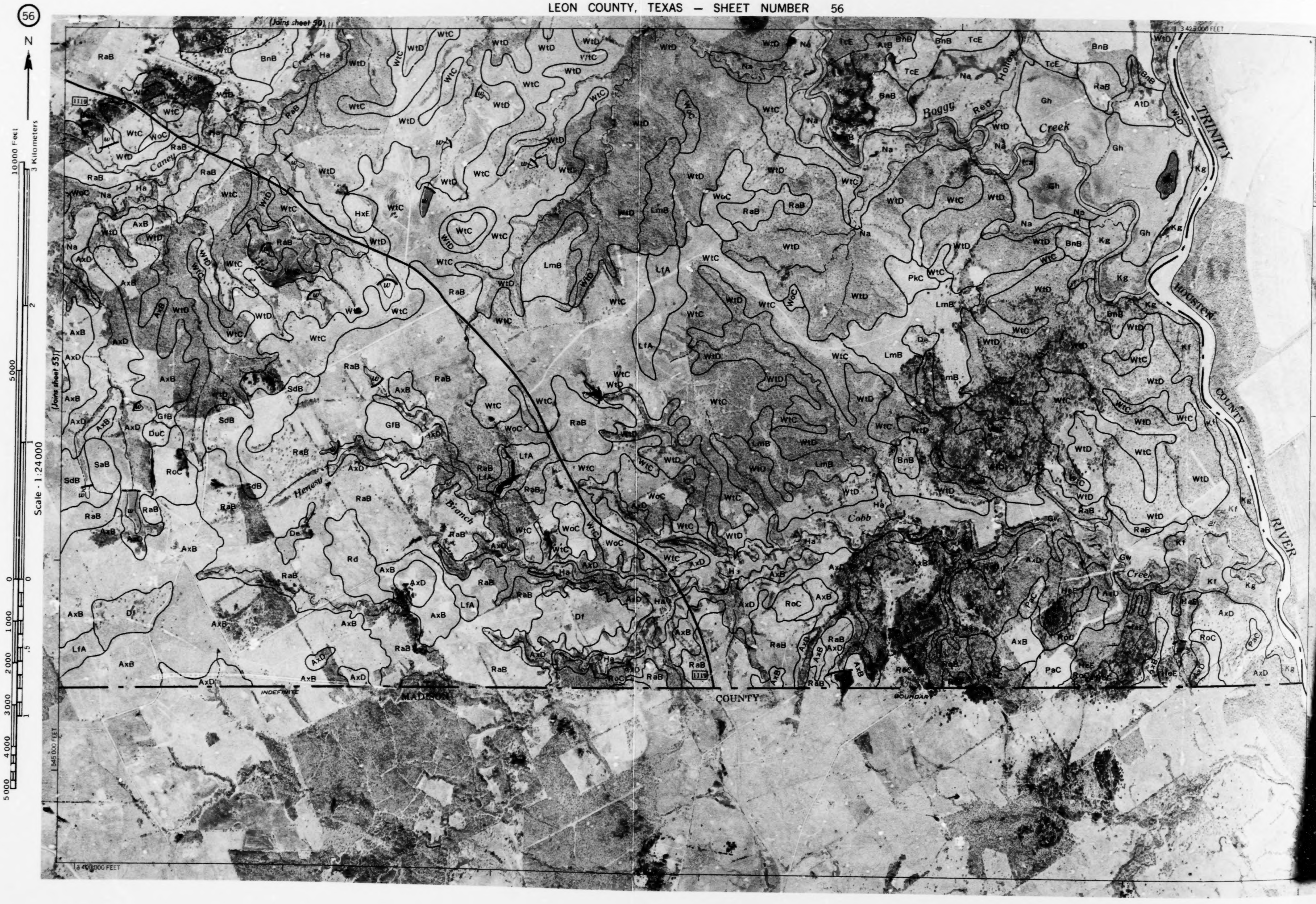
(56)

LEON COUNTY, TEXAS — SHEET NUMBER 56


N
(Joins sheet 50)
(Joins sheet 53)
Scale 1:24000
10000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
2
1
.5
Caney Creek
Henesty Branch
Cobb Creek
Boggy Creek
Red Hollow
TRINITY RIVER
HOUSTON COUNTY
MADISON COUNTY BOUNDARY
INDEFINITE
3 428 000 FEET
560 000 FEET
545 000 FEET
3 400 000 FEET
RaB
WtC
WtD
WoC
BnB
TcE
Na
Gh
Kg
AxB
AxD
LmB
LfA
SdB
GfB
SaB
RoC
Df
Rd
Ha
PkC
HxE
AtB
AtD
PaC
Kf
Gw
De

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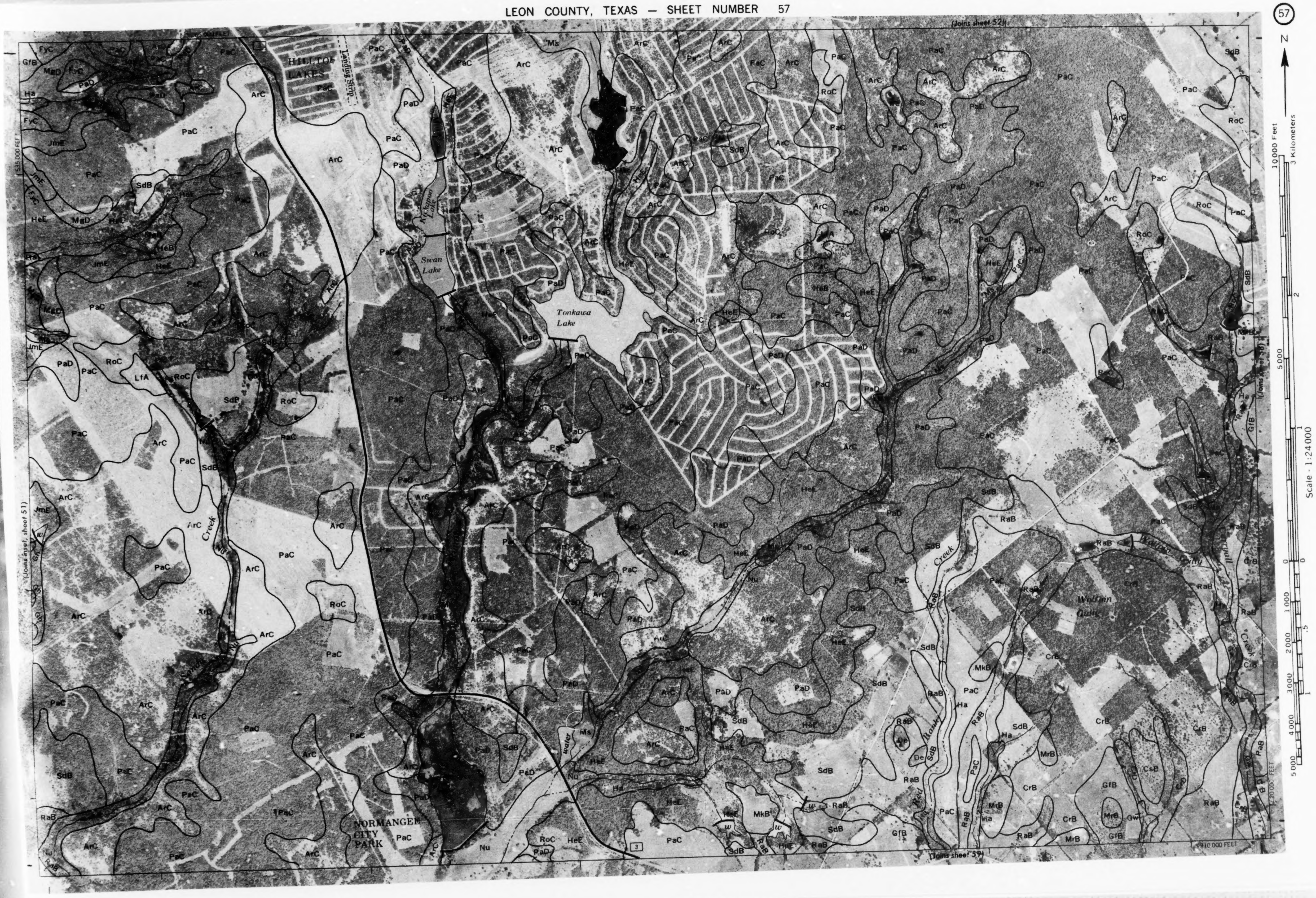
LEON COUNTY, TEXAS — SHEET NUMBER 57


(Joins sheet 52)
(Joins inset, sheet 51)
(Joins sheet 58)
(Joins sheet 59)
N
HILLTOP LAKES
Landing Strip
Swan Lake
Tonkawa Lake
NORMANGEE CITY PARK
Creek
Wolfpen Gully
water
3
10 000 Feet
3 Kilometers
Scale - 1:24 000
5000
0
1000
2000
3000
4000
5000
.5
1
2
ArC
PaC
PaD
RoC
SdB
HeE
HeB
JmE
MaD
FyC
GfB
Ha
LfA
RaB
MkB
MrB
CrB
GfB
Nu
Ms
Gw
De

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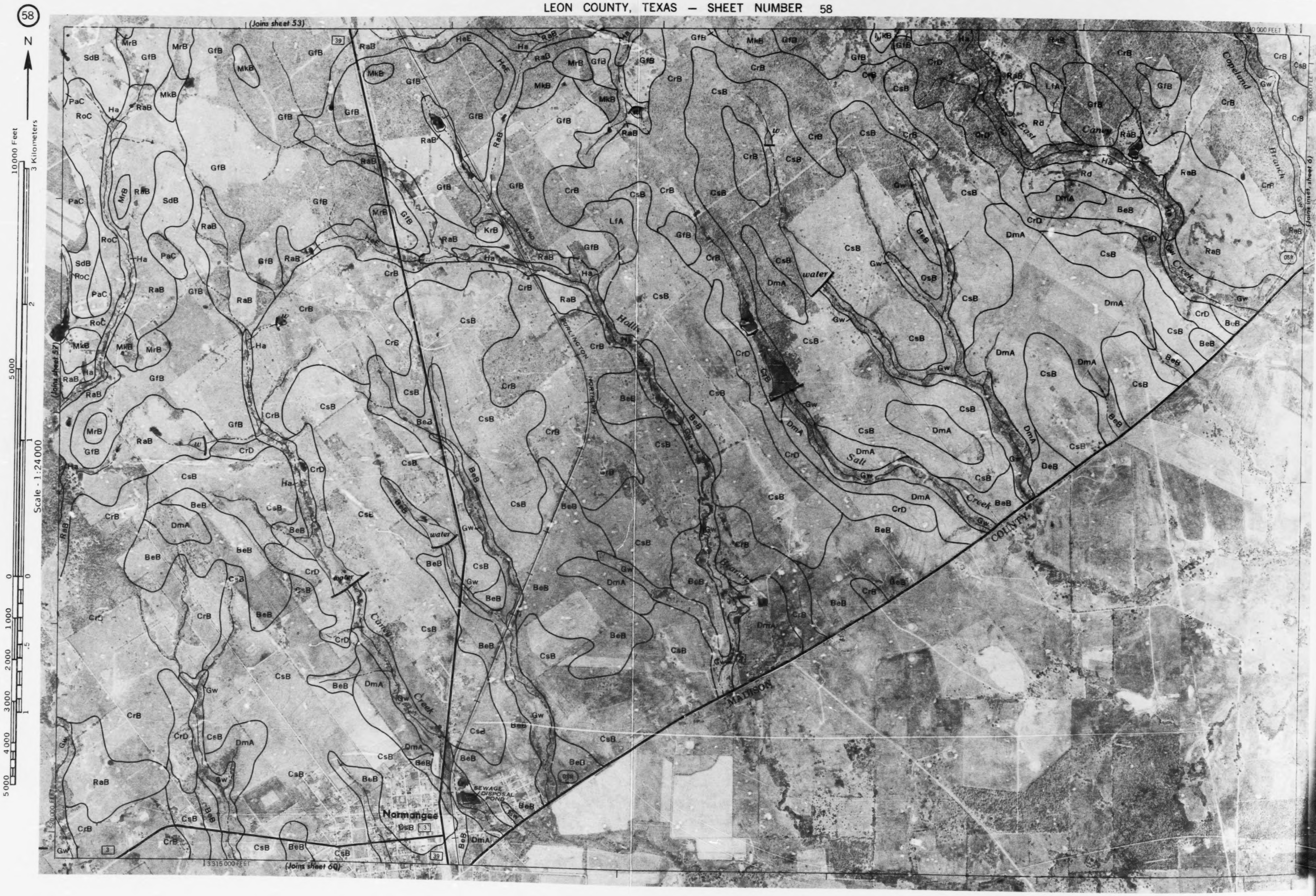
58

LEON COUNTY, TEXAS — SHEET NUMBER 58


N
Scale 1:24 000
10000 Feet
3 Kilometers
5000
0
1000
2000
3000
4000
5000
(Joins sheet 53)
(Joins sheet 57)
(Joins sheet 60)
(Joins inset, sheet 61)
3 315 000 FEET
40 000 FEET
Normangee
SEWAGE DISPOSAL POND
water
Hollis
Salt Creek
Curry Creek
East Caney Creek
Copeland Branch
MADISON COUNTY
BURLINGTON NORTHERN
39
3
OSR
SdB
MrB
GfB
MkB
PaC
RoC
Ha
RaB
PaC
HaE
KrB
CrB
CsB
LfA
DmA
BeB
CrD
Gw
Rd
w

...division corners, if shown, are approximately positioned. LEON COUNTY, TEXAS NO. 59

...Agriculture Soil Conservation Service

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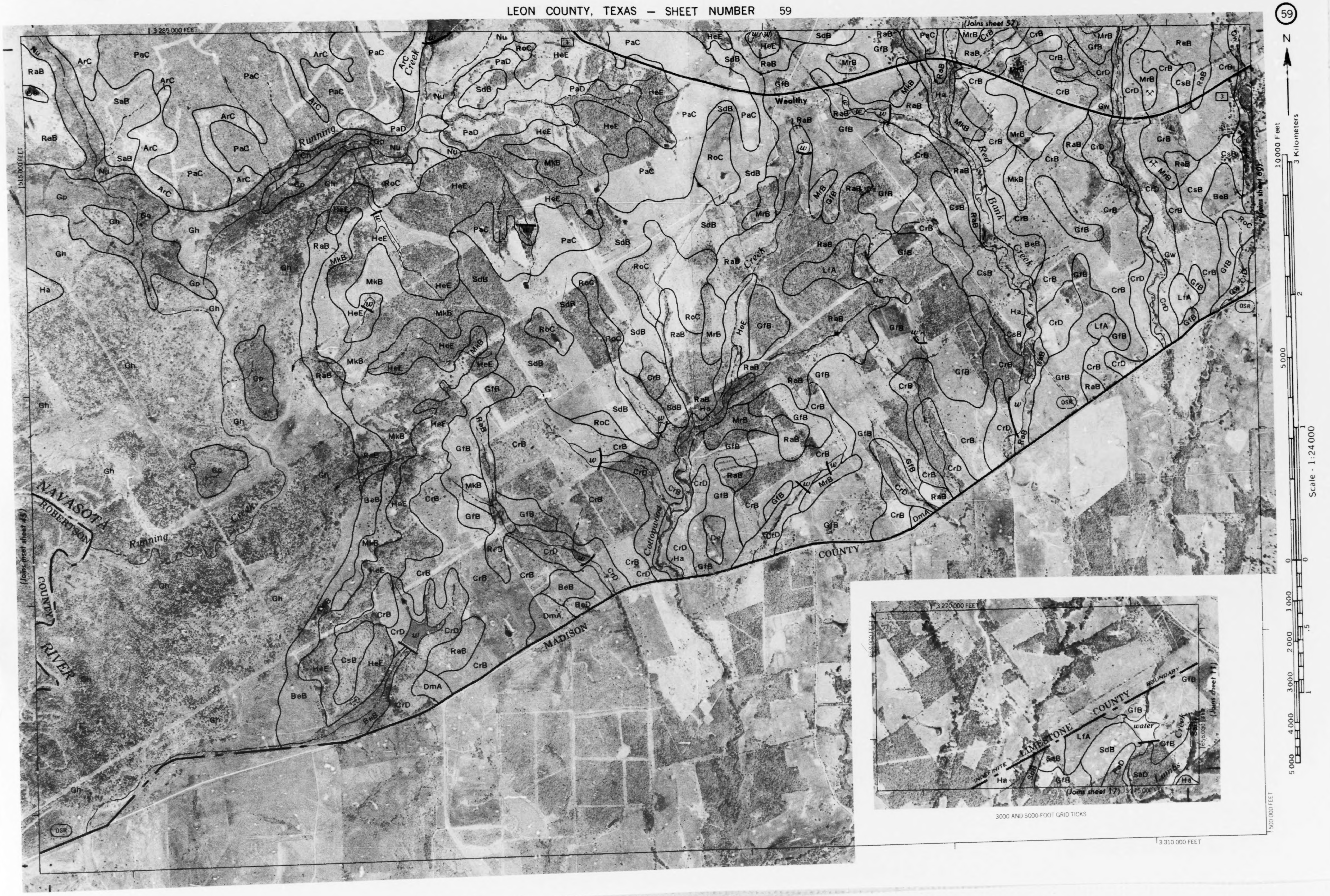
LEON COUNTY, TEXAS — SHEET NUMBER 59


59
N
(Joins sheet 57)
(Joins sheet 60)
(Joins inset sheet 45)
(Joins sheet 11)
(Joins sheet 17)
3 285 000 FEET
515 000 FEET
3 310 000 FEET
500 000 FEET
3 270 000 FEET
Running Creek
Arc Creek
Wealthy
Red Bank Creek
Cottonwood Creek
Creek
NAVASOTA RIVER
ROBERTSON COUNTY
MADISON COUNTY
INDEFINITE LIMESTONE COUNTY BOUNDARY
water
3 Kilometers
10 000 Feet
Scale 1:24 000
5 000
0
1 000
2 000
3 000
4 000
5 000
.5
1
2
3000 AND 5000-FOOT GRID TICKS
ArC PaC PaD RaB SaB Nu Gp Gh Ha HeE MkB RoC SdB GfB MrB CrB CrD CsB BeB Gw LfA DmA OSR W

and land division corners, if shown, are approximately positioned. LEON COUNTY, TEXAS NO. 59

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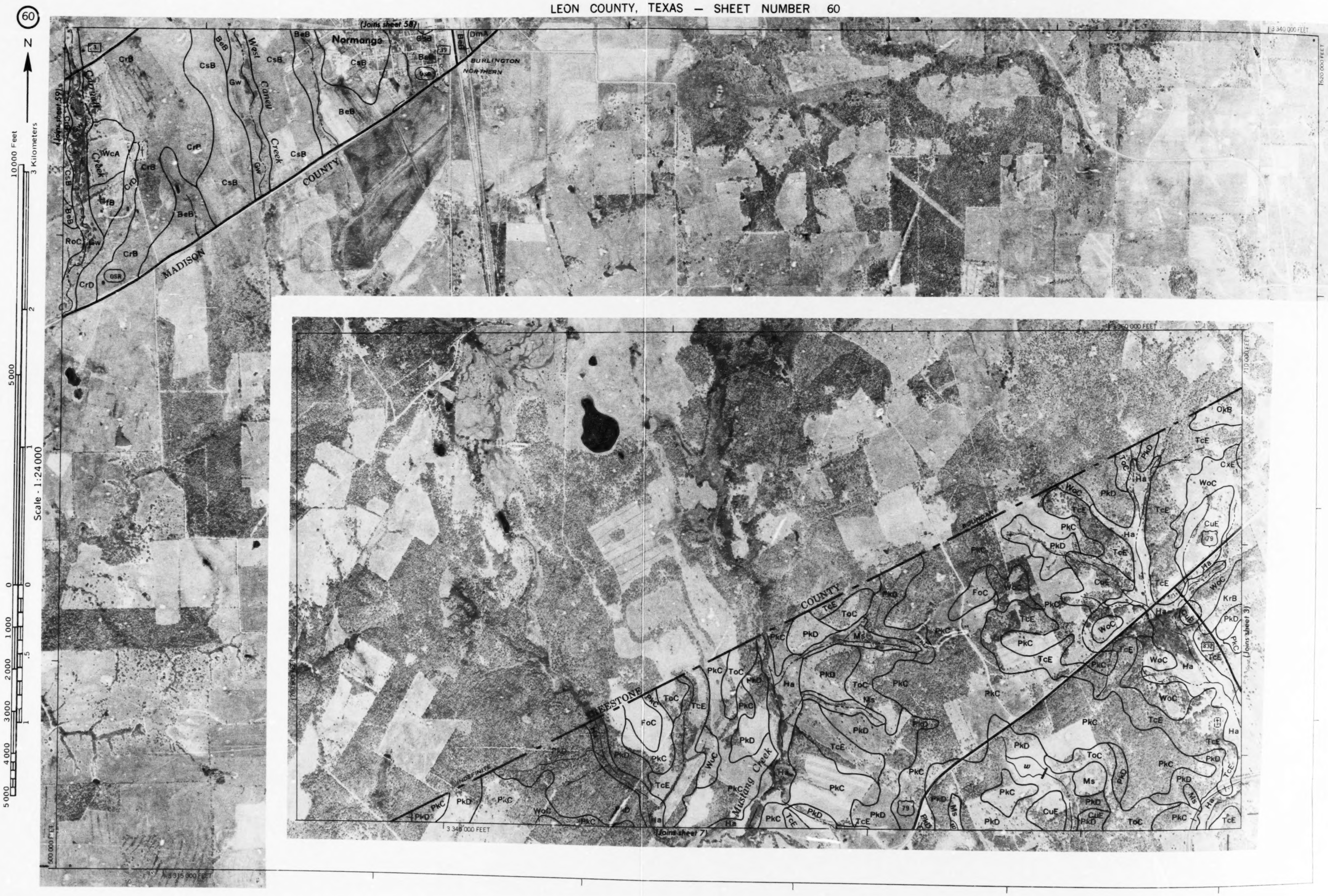
LEON COUNTY, TEXAS — SHEET NUMBER 60


60
N
Scale - 1:24 000
10 000 Feet
3 Kilometers
5000
2
1
0
1000
.5
2000
3000
4000
5000
(Joins sheet 58)
(Joins sheet 59)
(Joins sheet 71)
Normangee
BURLINGTON NORTHERN
West Canal Creek
MADISON COUNTY
LIMESTONE COUNTY BOUNDARY
Mustang Creek
3 340 000 FEET
500 000 FEET
CrB
CsB
BeB
Gw
WcA
CrD
RoC
DmA
PkC
PkD
ToC
TcE
FoC
WoC
Ha
Ms
CuE
CxE
KrB
OkB

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1979 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.
LEON COUNTY, TEXAS NO. 60

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